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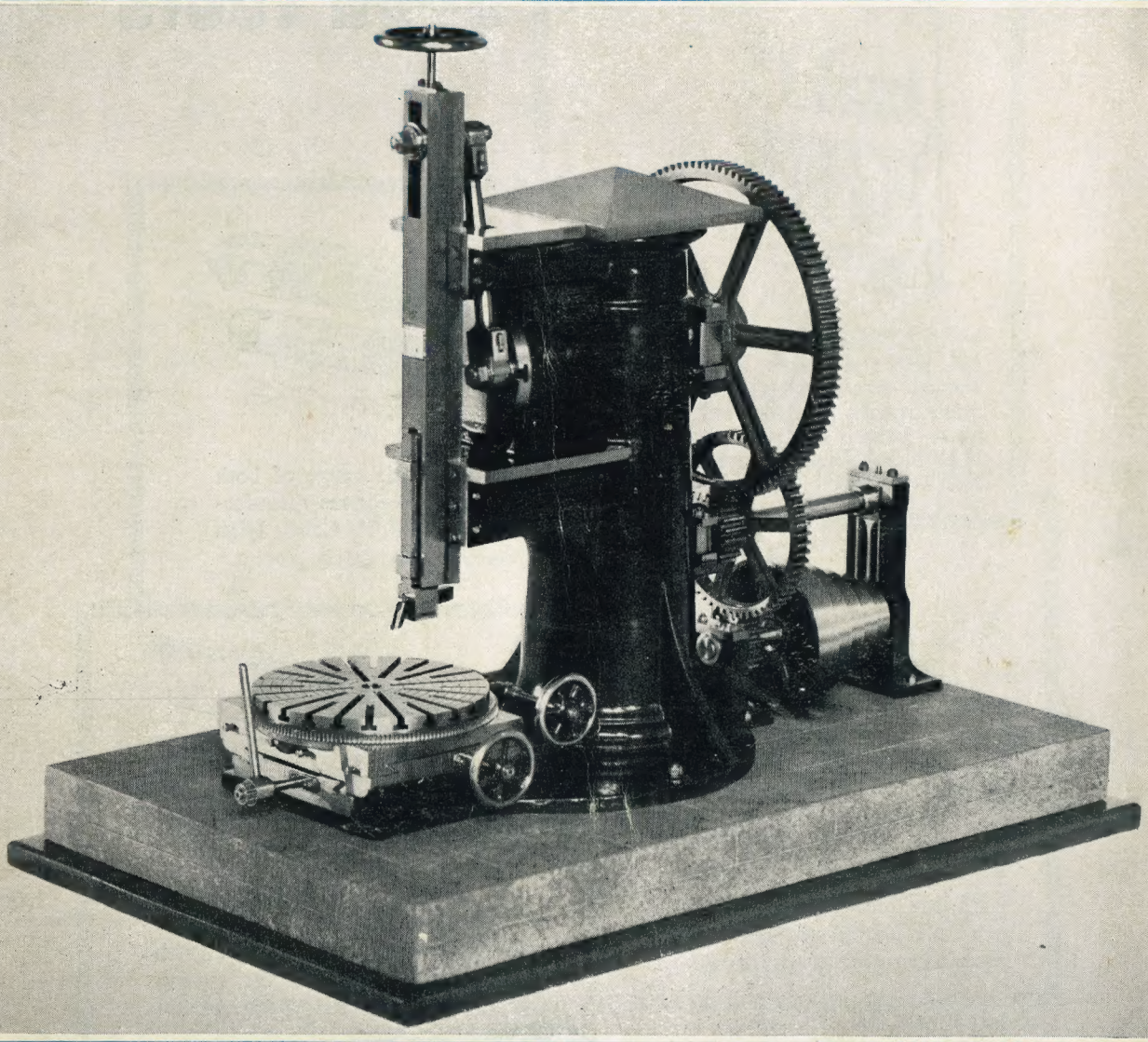

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NOVEMBER 18th 1954
Vol. 111 No. 2791

9D

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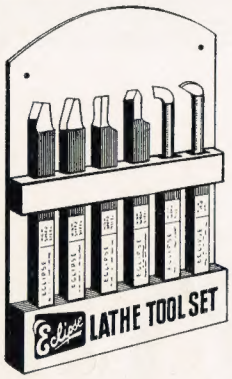
the name for good tools



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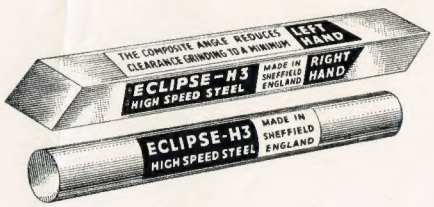
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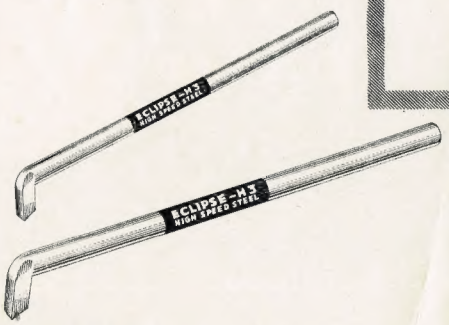

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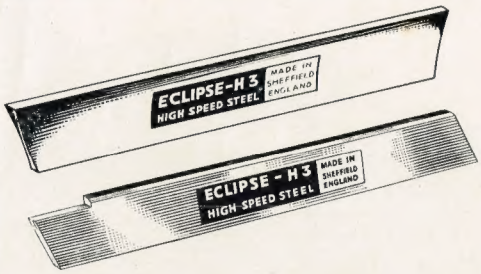

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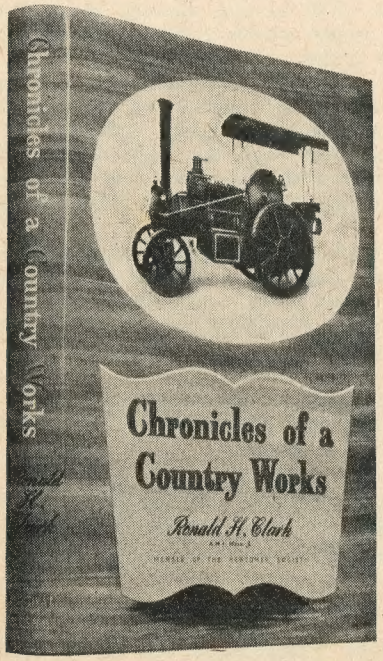

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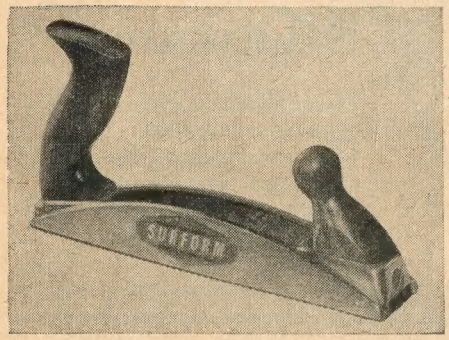

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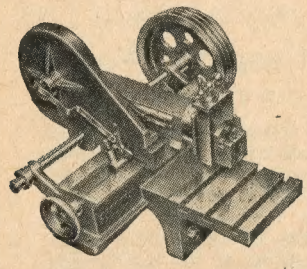

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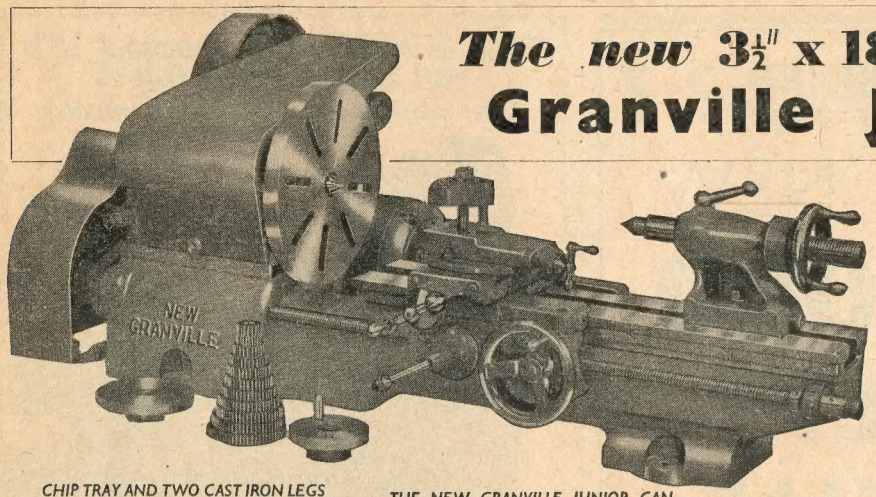

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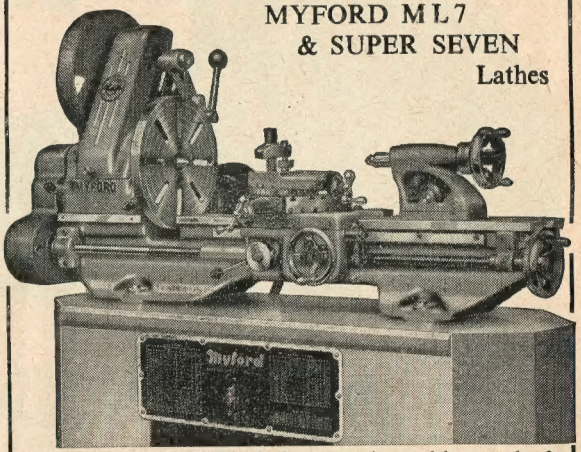

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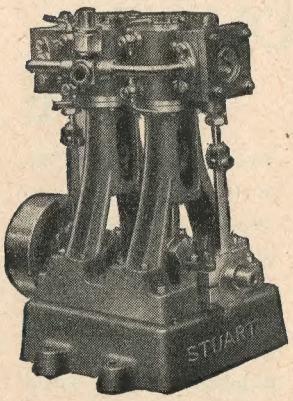

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THE
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NOVEMBER 18th - 1954

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OUR COVER PICTURE

The model shown in this photograph was built by Mr. L. J. Roe, of Twickenham, and exhibited at this year's "M.E." Exhibition. It represents a Shanks shaping and slotting machine, dated 1848, to a scale of 15/32 in. to 1 ft., and is fairly typical of the tendencies in the design of machine tools of this period. Although considerable advances have been made in engineering equipment since that date, the general principles of operation have not changed very greatly; the major differences which would be found in modern machines would be more massive structure, to cope with increased stresses and more rapid production, complete enclosure of all gearing, and provision for individual drive, by an electric motor, which in many cases is contained within the machine structure. This model, which embodies excellent workmanship and appears to be correct in working detail, is a good example of how a model can bring history to life, and illustrate in three dimensions the development of engineering design.

SMOKE RINGS

The "M.E." Speed Boat Competition

MODEL POWER boat enthusiasts are reminded that entries for this annual competition are accepted up to December 31st, and that runs made at any time during the year are eligible, provided that the necessary evidence in respect of timing, etc., can be furnished. In the case of runs made at a regatta which has been officially reported in THE MODEL ENGINEER, the speeds recorded will be accepted without extra documentary proof. The competition is open to all readers in the United Kingdom, whether members of organised clubs or otherwise; but in order to ensure that the difficult task of timing high speeds is properly carried out, it is necessary that all runs should be observed by skilled timekeepers approved by the Model Power Boat Association. Entry forms for this competition can be obtained, on receipt of a stamped addressed envelope, from the "M.E." offices.

Model Engineering Supplies

EVER SINCE the war, the rigid controls over the industrial supplies of raw materials have caused difficulties in obtaining the small quantities of certain metals and manufactured commodities used in model engineering construction; indeed, even ordinary "stock" ferrous and non-ferrous metals were hard to obtain up to two or three years ago. Prospects are much brighter now, but we are by no means out of the wood yet, and we still get many enquiries from readers regarding retail supplies, principally in respect of such materials as plastic materials, stainless or magnetic alloy steels, and the less familiar non-ferrous alloys, for which we are unable to furnish satisfactory answers. We can find the manufacturers or wholesalers of these supplies easily enough, but to persuade them that it is worth their while to cater for the small requirements of our readers is another matter. Some of our advertisers are enterprising enough to undertake the supply of special material for which there seems to be a growing demand, and we are always glad to bring these facilities to the notice of readers, but there is room for much improvement in the entire supply situation, still. The question is not merely one of enabling our readers to make models in the ordinary way; sometimes the success or failure of a new industrial development, or even an epoch-making invention, may depend on the availability of some small piece of special material. We would exhort manufacturers to give consideration to the small buyer; he may be unprofitable or even a nuisance at the time, but the willingness to oblige him may turn out eventually to be a very sound long-term policy.

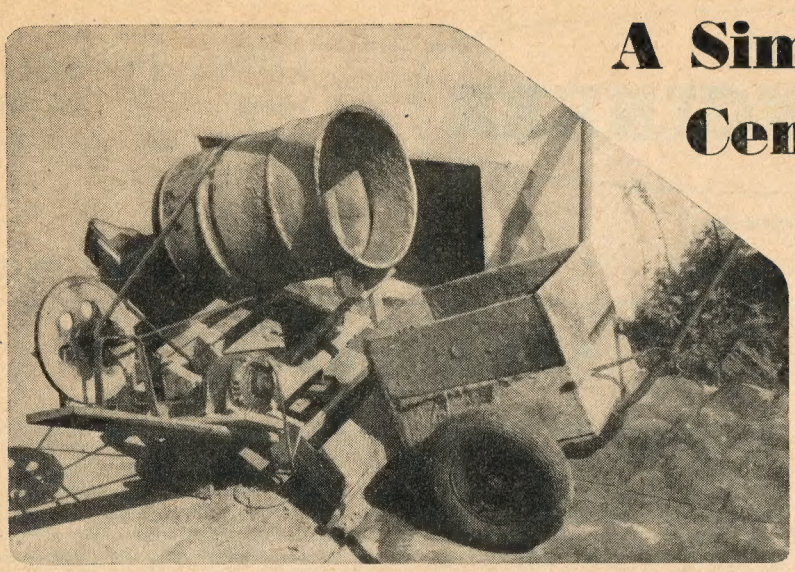
Beyer, Peacock & Co. Ltd.

ONE OF the lesser-publicised centenaries of the year 1954 is that of the world-renowned locomotive-building firm of Beyer, Peacock & Co. Ltd. of Gorton, Manchester; for it was in 1854 that this firm was founded by two far-seeing engineers, Mr. Charles Beyer and Mr. Richard Peacock. It was the former gentleman who soon began to exercise a widespread influence on the design and construction of locomotives in general; for, not only did he take the greatest possible care over the appearance of all locomotives built in the Gorton factory, but he always insisted that nothing but the best in materials and workmanship should go into any of the firm's products. The result was that a magnificent reputation was quickly built up, and it has been steadily maintained up to the present time.

Although locomotives of all sizes and types have been the firm's principal products, much machinery of other kinds has been made, a lot of it for use in maintaining and repairing locomotives. It is interesting to recall that, in all Charles Beyer's locomotives, all curves in frames, in chimney-caps, dome covers and safety-valve bonnets were true curves and not merely arcs of circles. This is only one example of Beyer's ideas of strict attention to detail; but there can be little doubt that it paid a handsome dividend in the faith and confidence it inspired in the firm's customers all over the world; for the same kind of care was insisted upon in constructional methods, down to the smallest components.

A Simple Cement Mixer

By R. Parfitt



Side view of mixer with hand-cart in position ready for the mixed concrete to be raked out

Editorial Note

On seeing the title of this article, some of our readers may be inclined to ask the old question: "Is this really model engineering?" We have good reasons for including the subject within the scope of this journal, however, for we know that many model engineering societies, and individual readers have to deal with major operations in the use of concrete for building model railway tracks, club buildings, etc., and feel sure they will welcome practical information on any means of lightening the manual labour involved in these operations.

THE writer is blessed, or maybe cursed, with a large three-roomed workshop below the house, and mainly below ground level. Water used to seep and trickle in through walls and floor, while machinery and tools dripped and rusted Correspondence and articles in THE MODEL ENGINEER over the last few years were studied. The various authors agreed that the presence of water was essential for rust to form, and most of them showed ways by which this water could be stopped from reaching metal objects. Thus, if water could be kept out of the workshop and its atmosphere, there would be no rust. This, of course, is an impracticable solution, but nevertheless, standing water and obvious dampness should be cured.

The writer, therefore, set out to waterproof his cellar. He started in a small way with a little cement here and there, but with somewhat disappointing results. In fact, when one evening he went down to collect coal and found himself in six inches of water, he became somewhat disheartened, besides reacting in a way common to those who paddle unintentionally. The inundation was simply cured, however, by unblocking an adjacent sewer. The ease with which the water ran out as well as in, showed that a major cementing project would have to be undertaken. This was duly planned and started. For those who are similarly placed, sound advice is: Go to a public library and read all round the subject.

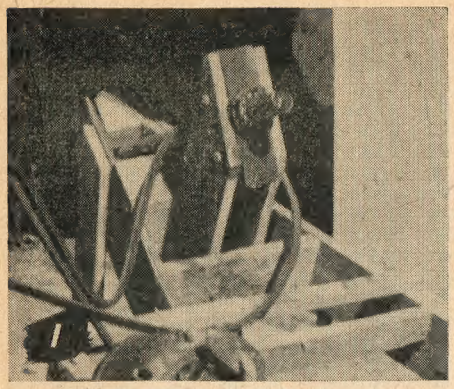
The surest cure can be summed up in ten words, i.e., two layers of waterproofed concrete, well mixed, laid, and cured. Work commenced, but it was soon found that much backbreaking labour with a spade was involved in mixing the cement with its waterproofing powder, aggregate and water. When the writer's back was finally broken, he set about making the cement mixer, a description of which is the main purpose of this article. It has made concrete mixing, if not a pleasure, at least endurable.

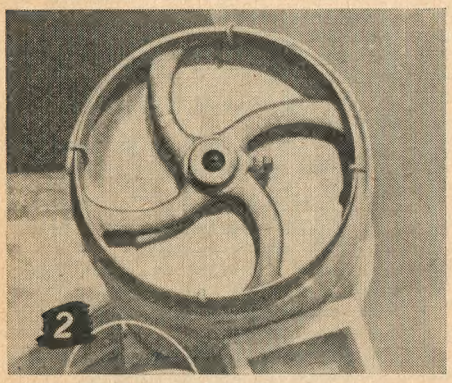
A cement mixer consists essentially of a container, usually round, rotating in such a way that the cement-aggregate mixture continuously tumbles over itself, or tends to be lifted by the ascending inner surface. Some device must be provided so that when water is added, and the mixture becomes doughy, it is not possible for the whole mass to move round in one piece without being mixed. A glance into almost any commercial mixer will show that such a device consists merely of two or more baffle plates mounted inside the container, so that each scoops out a slice of the mixture, and later drops it again, during each revolution. A start was made by setting out to buy a dustbin for the container, but a visit en route to a dealer specialising in everything from Thrupple nuts to Guffle irons produced an oil drum 23 in. high by 17 in. in diameter for a few shillings. The scrap box yielded an iron wheel 15 in. in diameter, with a three-inch flange and hub. The wheel was fixed to the bottom of the drum, as shown in the photographs, by means of several 4 in. × ¼ in. hook bolts. Each was hooked over the edge of the rim, passed along its inner surface and through a hole in the bottom of the drum, where it was secured by a nut over a large washer. Thus, the wheel could not slide about the bottom of the drum, neither could it be lifted away from it. A hole was drilled through the centre of each spoke. Wooden spacers filled the gap between the spoke and the bottom of the drum, and a bolt through into the drum again made all secure. The hub had a machined hole for a 1⅛ in. shaft. Part of an old lorry back axle, about 18 in. long, was centred and one end turned a nice running fit in the hub. A thrust race and an old change wheel as a thrust plate completed the bearing. The other end of the shaft was drilled along its axis, and tapped for a $\frac{5}{16}$-in. bolt.

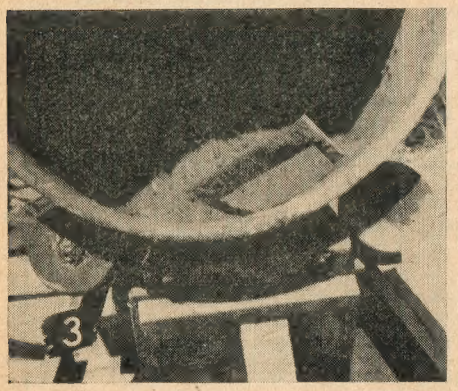
Utilitarian

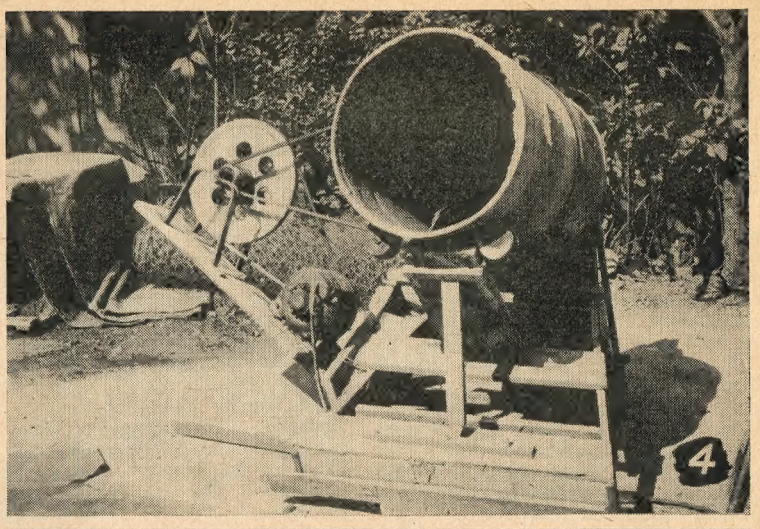
It might be mentioned at this stage that this mixer is strictly utilitarian. The only joy the writer could detect in its design and construction lay in the thought that soon the Electricity Authority would be taking over from the single manpower engine previously employed. It follows that it was not considered necessary to scrape the bottom of the drum flat to the surface plate before fitting the wheel, neither was the shaft lapped into its hub. The woodwork now to be described was done with a degree of precision about the same as might be expected of a packing-case maker. Indeed, the comparision is close, as the wood came from packing cases. The best way to join two bits of wood under these circumstances is to hammer a nail through and clench it over on the other side.

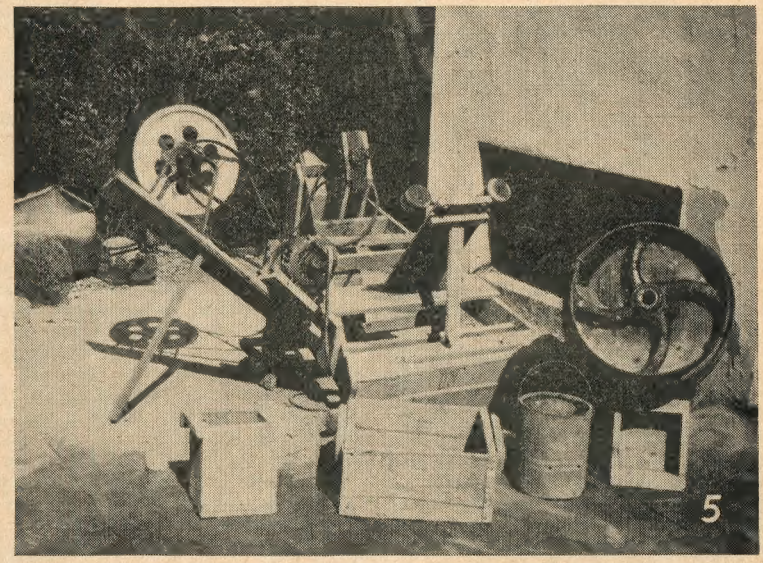
A cement mixer is expected to work anywhere on the site. A triangle was thus chosen for a base as, with a brick under each corner, it will always be steady. It had two sides 48 in. and the third 28 in. It was assumed that the drum was to be at 45 deg. to the ground, so the shaft was mounted at this angle, with its plain end bolted to a bracket near the apex of the triangle. Purchase was gained on the other end by boring a hole through a piece of 3 in. × 2 in. wood, a firm push fit on the shaft. This was bolted as shown in the

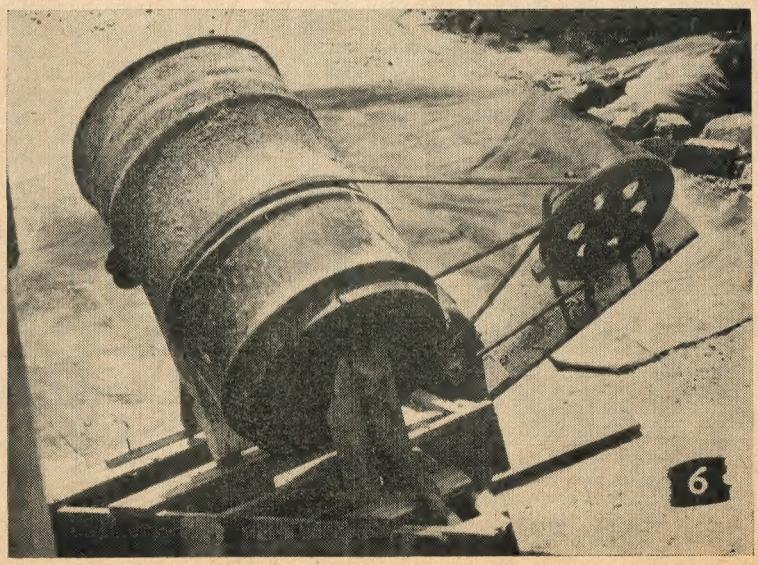












1. A close-up view of the shaft and thrust-race

2. Showing how the wheel is bolted to the end of the drum

3. Close-up view of the roller-bearing and of one baffle plate pushing its way through the mix

4. The completed mixer after about 50 hours use

5. The mixer with drum removed. Various measuring containers are seen in the foreground

6. Rear view, showing the axle mounting and motor platform

photographs. The mounting is quite satisfactory, and has never been touched since. The drum was then placed on its axle and rotated to ensure reasonable accuracy of mounting. Surprisingly, it ran with only about ⅛ in. of wobble. The base was strengthened by a few struts and attention turned to the drive.

A long-suffering ¼ h.p. induction motor (1,440 r.p.m.) was bolted to a board as shown, and coupled by a standard V-belt to a large pulley. This ran free on a ¾-in. shaft supported by two brackets of 1 in. × ¼ in. mild-steel. At each end, the shaft was reduced to half-round, and ¼-in. bolts passed through it, and the brackets. A smaller pulley was bolted concentrically to the hub of the large one. The original set-screws were replaced by bolts and springs, grease being packed into the holes first. This somewhat crude form of lubrication has been entirely satisfactory. Each bolt is given a turn before a day's run. It is hoped that the purists will not experience a rise in blood pressure at the thought of a mild steel/light alloy bearing. A long V-belt connects the small driven pulley with the drum. Pulley sizes are as follows:

Motor 1½ in.
Large 12 in.
Small 2 in.

A smaller countershaft-driven pulley should not be used, or trouble will arise from slip. There is only just enough friction between the belt and drum, and a modification will be suggested later.

The motor and its countershaft are mounted by hinges as follows. First build a vertical platform in the position shown, on one side of the triangular base. It should be about a foot long by some six inches deep, and be in a true vertical plane. By this means it is a simple matter to screw home the hinges so that the countershaft is parallel with the drum and its axle. For convenience, the hinge pins were removed and replaced by longer rods tethered to the base with string. The motor and countershaft can thus easily be removed. The length of the long belt should be such that the motor board is at about 45 deg. to the ground.

A Mix-up!

When this stage was reached, the writer fondly believed he then possessed a working cement mixer. The motor was switched on and the container revolved smoothly and silently. About half a cubic foot of mixed aggregate was shovelled in and the long belt then slipped on the drum. Weight, in the shape of an old motor tyre, was added to the end of the motor board, and the whole mixer toppled over on to its side. It was righted and counterweighted with bricks on the other side. It once again ran smoothly, but a glance into the drum showed the aggregate merely moving stealthily round the bottom. The drum was removed, and two 18 in. pieces of 1 × ⅛ in. M.S. were bolted, by means of brackets of the same material, to the bottom near its circumference, and to a point about 15 in. up the wall. They were sloped backwards away from the plane of the axis, the object being that at each revolution a portion of the mix should be pushed up towards the mouth of the drum. The aggregate, however, stayed morosely near the bottom; the angle was evidently much too steep. The base was accordingly tipped up until a suitable angle was found, and held there by struts. It has been found an advantage to be able to vary the angle according to the mixture. A sand-cement mixture allows a flatter angle than a mix containing coarser aggregate. The nearer horizontal the container became, the greater was the strain on the bearing. A simple roller bearing was therefore fitted to support the drum near its rim. The ever-ready scrap box disgorged a pair of double-wheel castors. These were screwed to the ends of a piece of ½ in. round M.S. rod, which was mounted, free to turn, across the end of a piece of board by two U bolts. The board was hinged to a cross member of the base and the castors propped up against the container. It also has given no trouble.

Modifications

There are two modifications suggested for those who propose to make mixers of their own. The triangular base, although logical, is somewhat inconvenient, as the weight of the motor tends to make it tip. A well-trussed rectangular frame would probably be better. It was mentioned earlier that trouble was experienced from the belt slipping on the drum. This may easily be cured by riveting to the drum a circle of extruded aluminium channel. The drum thus takes the form of a rather primitive kind of V pulley.

It was stated above that the writer's back was by no means unbreakable. With this in mind, another vertebral conserver in the shape of a simple handcart was built to take the place of a wheelbarrow. A moment's thought will show that half the load in a wheelbarrow is carried by the wheeler himself. Two ex-aeroplane landing wheels, a piece of 1 in. steam pipe, a wooden box, and a castor were put together to form the small handcart seen in the photograph. Three cwt. of mixed concrete can be wheeled away from the mixer, with very little effort. Where a steep slope has to be climbed, a piece of rope attached to the handle enables one to haul it up, rather like a successful tug-of-war played against bogey. A wheelbarrow would strongly resent such treatment.

Finally, on one of the photographs the mixing measures may be seen. A small box should be made to take the desired amount of cement to mix with half a cubic foot of aggregate. The latter should be measured in a similar larger box. Make these boxes very strongly, as they have a hard life. Observe also the tin. It only looks like a tin. It is, in fact, a highly scientific water measurer. By trial and error, or even calculation, the correct amount of water for each half cubic foot of aggregate and cement is found. This is placed in the tin, and a row of holes punched just above the water level. Dents are then made in the tin, whose capacity is thus so adjusted that any excess water over the desired amount runs out. The tin is placed under a gently running hose so that each time water is needed there is exactly the right amount in the tin.

Cement mixing now becomes a continuous, varied, and not over-laborious process. Start with all measures filled and the mixer running. Proceed as follows:—

1. Pick up half a cu. ft. aggregate, and tip into mixer.
2. Tip cement in from its measure.
3. Refill aggregate box while the two mix.
4. Tip in water.
5. Replace water measure under hose.
6. Refill cement measure.
7. Wheel handcart to mixer and, using garden hoe, rake out the now ready mixed cement into it and wheel out of the way.
8. Repeat 1-7 until handcart is full.
9. Switch off, and lay concrete.
10. Repeat 1-9 until enough is laid.
11. Clean mixer by pouring in a gallon or so of water and a spadeful of aggregate. After a minute or so, remove container and up-end on the ground.

Next Week . . .

OUR DRILL DATA SUPPLEMENT

Information in tabulated form on tapping and clearance size drills for all standard threads, specifications of fractional, number and letter size drills, etc.

SOLID-FUEL MARINE BOILERS

A description and scale drawing of the coal-fired Scotch boiler in the steam tug *Smoky* by Mr. A. E. Perman, of the West London Model Power Boat Club.

A SMALL AIR COMPRESSOR

Concluding the description of the "Duplex" vee twin compressor plant.

A CIRCULAR-SAW BENCH

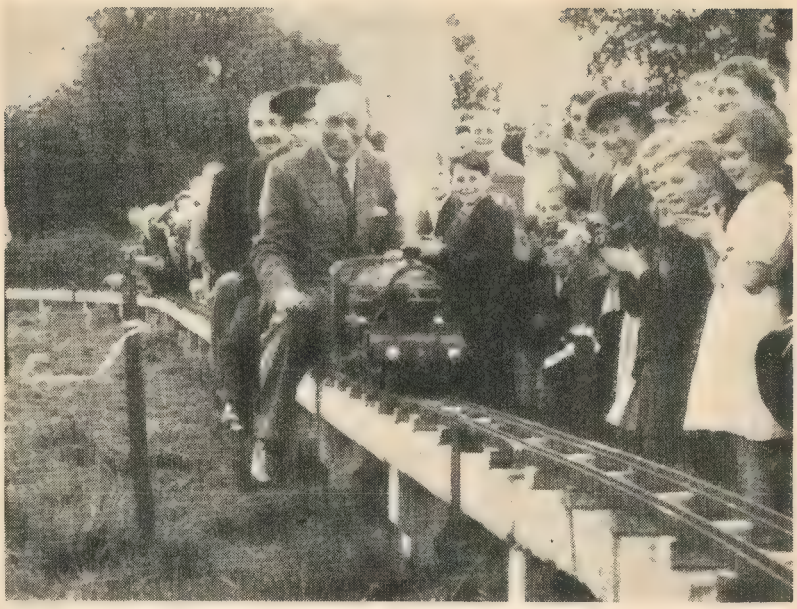
A reader's description of a versatile and useful piece of equipment built in the home workshop.

"TITFIELD THUNDERBOLT"

"L.B.S.C." provides all the "words and music" for making up and assembling horns and axleboxes for the 5-in. gauge engine.

The Arkleyway N.L.S.M.E. Track

By "P.R.O."



Mr. E. Stace performing the opening ceremony by breaking the tape and driving a loco round the new track

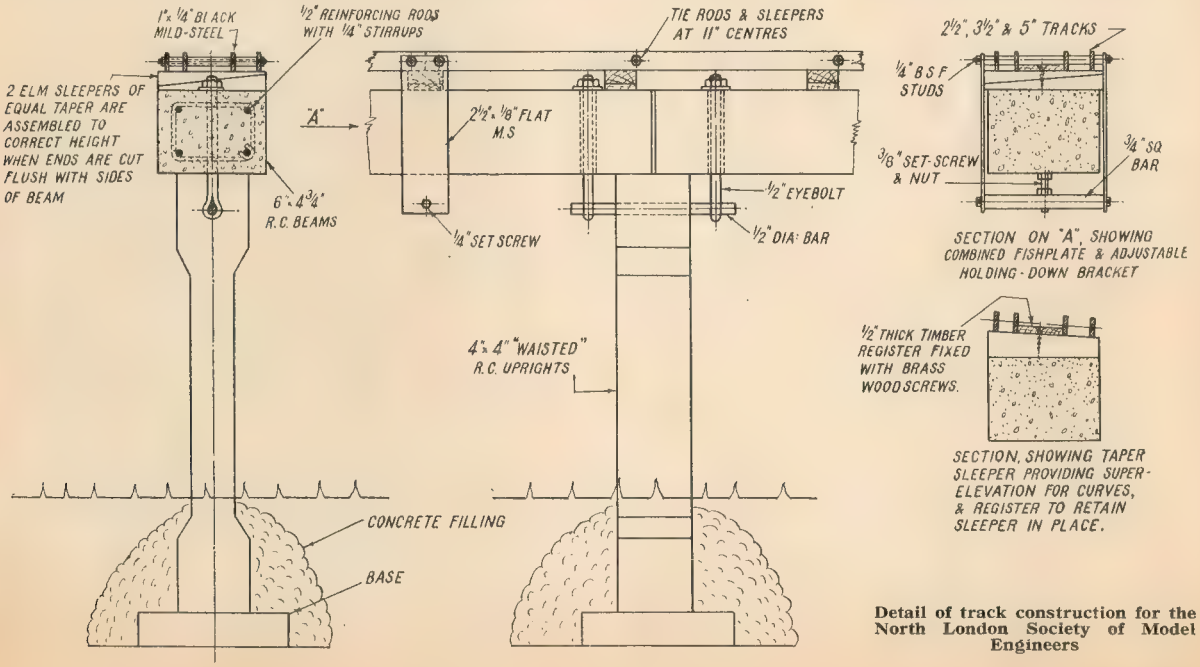
AT Arkley, not so very far from Barnet Church, lies the Barnet Water Co.'s sports ground. In the summer they play cricket there, and in the winter, soccer. The N.L.S.M.E. seems to have quite a pull with the Water Board, inasmuch as it has been allowed to build a multi-gauge locomotive track right alongside aforesaid cricket and soccer pitches.

Now we are awaiting the day when the driver of one of "them there small engines" gets a smack in the ear from a cricket ball; it should be quite good fun to see how fast his locomotive can travel minus driver! Of course, if he is fool enough to steam up in the winter, a soccer ball is even more effective.

By now, you have probably gathered I am not taking this description of our track too seriously. There are reasons for this: one is that nearly all the track descriptions I've read seem to be the same, and, as I am an individualist, I cannot possibly copy out someone else's report of their track—that's cheating, you know!

There is another peculiarity about our track; although it is on the Barnet Water Co.'s sports ground, we ain't got no water: we have to get it in buckets! Moreover, to get at it with a locomotive behind a car or van, you must ride round the edge of the cricket or football pitch. Now this ain't flat; no sir, anything but, and several cases of sea sickness have already been reported, with the result that these good folks are talking of leaving the loco section and joining the "ships and boats crowd." That's all right with me, because it leaves me more room on the track; so I'm arranging with the groundsman for a few more dips and bumps to be inserted in the ground.

(*Continued on page* 592)

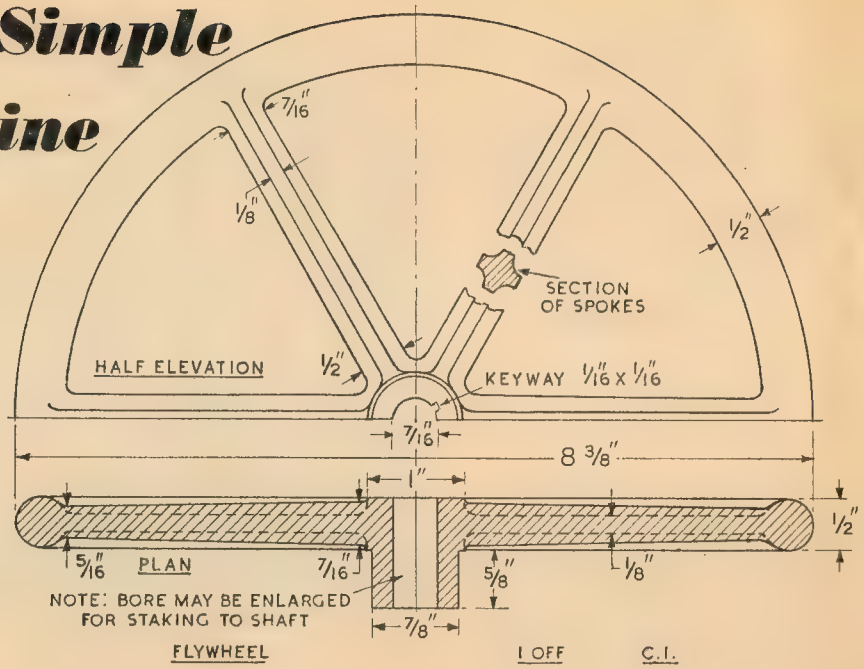

1" x 1/4" BLACK MILD-STEEL
1/2" REINFORCING RODS WITH 1/4" STIRRUPS
TIE RODS & SLEEPERS AT 11" CENTRES
2 ELM SLEEPERS OF EQUAL TAPER ARE ASSEMBLED TO CORRECT HEIGHT WHEN ENDS ARE CUT FLUSH WITH SIDES OF BEAM
"A"
2 1/2" x 1/8" FLAT M.S
6" x 4 3/4" R.C. BEAMS
1/2" EYEBOLT
1/4" SET SCREW
1/2" DIA: BAR
4" x 4" "WAISTED" R.C. UPRIGHTS
CONCRETE FILLING
BASE
2 1/2", 3 1/2" & 5" TRACKS
1/4" B.S.F. STUDS
3/8" SET-SCREW & NUT
3/4" SQ. BAR
SECTION ON "A", SHOWING COMBINED FISHPLATE & ADJUSTABLE HOLDING-DOWN BRACKET
1/2" THICK TIMBER REGISTER FIXED WITH BRASS WOOD SCREWS.
SECTION, SHOWING TAPER SLEEPER PROVIDING SUPER-ELEVATION FOR CURVES, & REGISTER TO RETAIN SLEEPER IN PLACE.

Detail of track construction for the North London Society of Model Engineers

Making a Simple Beam Engine

A CHARACTERISTIC DESIGN BASED ON EARLY NINETEENTH CENTURY PRACTICE

By Edgar T. Westbury



BEFORE concluding the description of the beam and connecting-rod, mention may be made of the various pins which have to be fitted to these items; they have already been referred to briefly, but I have been reminded by a reader that many constructors find snags in making pins a press fit in cast-iron, owing to the brittleness of this material. There should, however, be no real difficulty about this if discretion is observed in machining and fitting. On small pins, it is not necessary or desirable to give more than "half-a-thou." interference; if this is found inadequate to provide proper security, the usual reason is that roughness of the parts—possibly due to the use of a file in finishing the pins, or relying on a drill to finish the bores—results in making contact only on the high spots. Smoothness, which is by no means the same thing as high polish, is essential for proper press fitting, and another important thing is to make certain that the pressure applied is truly on the axial line of the pin when it is inserted, so that it goes in squarely with the minimum of effort.

In the case of the pin in the forked end of the connecting-rod, special care is necessary to avoid distorting the fork when it is pressed in; for final fitting, of course, the end of the beam will be in place, and if no side play is allowed, this will support the fork. The pin is, of course, a running fit in the beam, and a press fit in the fork. Some constructors fit a bolt and nut in this and similar joints, but I have never seen a beam engine with such a fitting—much less a slotted screw, though such things often rear their ugly heads in models, to the horror of conscientious judges.

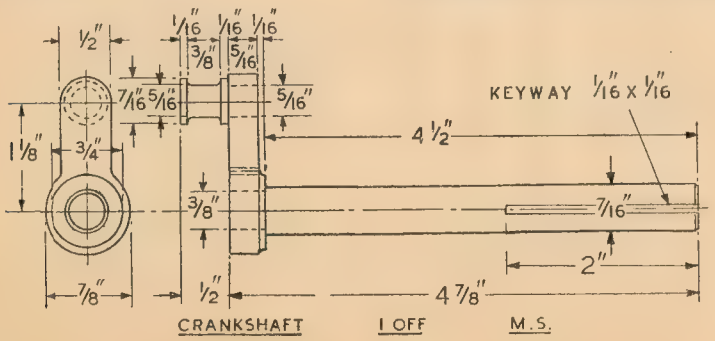
Continued from page 533, *November* 4, 1954.

Flywheel

This is also an iron casting, and if it is reasonably clean and true, requires no external machining, as this would not be done on the prototype; but there should be no bad roughness or excresences on the casting, and it may be found desirable to do a little truing up with a file on the rim while the casting is set up for boring. Light wheel castings sometimes distort or "buckle" in cooling, and in view of the brittle nature of cast-iron, they cannot be straightened, though I have heard of bolting the wheel between heavy steel plates, heating to redness and cooling slowly, as a practical remedy.

Assuming, however, that this trouble does not arise, the wheel can be set up for boring in the same way as I have recommended for the flywheels of the "Unicorn" and "Tangye" engines; namely, by mounting on the faceplate with bolts and straps across the spokes, and resilient packing behind them to avoid bending stress. The rim should be set to run true on periphery and edge, and the hub is then faced and bored; machining on the outer extension is optional but will probably be desirable, especially if the hub is used as a seating for a driving pulley or gearwheel.

In early engines, flywheels were usually fitted by methods inherited from the wheelwright, namely, by "staking" to the shaft by wedges inserted from either side. The hubs were rough-bored by the primitive devices then available, or sometimes only cored out and filed square or circular according to the shape of the shaft, to a size sufficiently larger than the shaft to allow of inserting the wedges; the latter were driven in all round, with individual adjustment to true up the wheel. In



some cases, hardwood wedges, in sufficient quantity to practically fill the annular space, were employed, but later practice favoured about four or six stakes, made in metal, in the form of folding wedges, and seated on flats or shallow keyways in the shaft. Similar seatings in the hub, to provide a positive drive, evolved from this practice, and development of the modern method of fitting wheels with one or more deep-seated keys or splines followed as a logical result.

In the present age, I imagine that few constructors will fancy the job of staking a flywheel, which can be, and usually is, a finicky and tedious business ; I have often watched wheelwrights staking the axleboxes of cartwheels by this time-honoured method, and I do not fancy it myself. For this reason I have specified close fitting of the hub on the axle, and a single plain key, of greater depth than is usual in modern practice, to provide a positive drive. The keyway in the hub can be planed by methods which have been described more than once by myself and other contributors. I cannot say definitely at what date this method of fitting wheels was first adopted in engineering practice, but I do not think it would be objected to in an early period model.

Crankshaft

I have already mentioned that early engines usually had the crankshaft forged from square bar, turned circular only at the bearing journals, but in this respect also, I feel that some licénse is permissible, owing to the difficulty of fitting the flywheel and eccentric sheave to a square shaft. The crankshaft is, therefore, shown as circular and parallel over its main length, and it can be built up from three pieces, comprising mainshaft, web, and crankpin, assembled by pressing together and riveting.

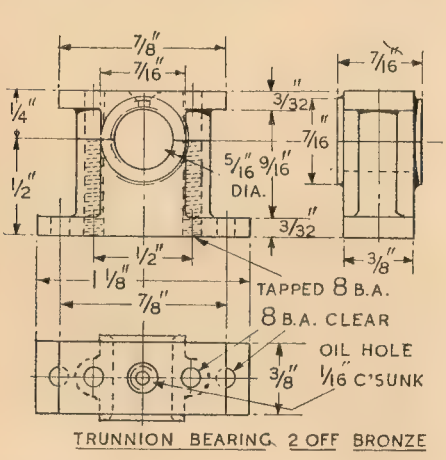
A piece of bright drawn or ground rod of the finished size may be used for the first-mentioned part, if it can be chucked truly for turning the web seating; leave a slight fillet in the shoulder to avoid weakening it, and it is advisable to centre-drill both ends of the shaft, so that the assembly can subsequently be mounted between centres if desired.

The web may be filed or machined on the external contour, from mild-steel bar of a minimum size of $\frac{7}{8}$ in. by $\frac{3}{8}$ in., and, after marking out the bore centres, should then be clamped on the face-plate for boring the holes, as this will ensure that they are exactly parallel, and square with the face. The main bore should have a slight radius at the mouth, to clear the fillet on the shaft, and the other end should be slightly countersunk for riveting. On the inner side, the web is faced back to leave a centre boss $\frac{3}{4}$ in. diameter by $\frac{1}{16}$ in. deep, but as it will not be easy to machine this at the initial seating (due to the clamps getting in the way) it can quite conventiently be done after mounting on the shaft.

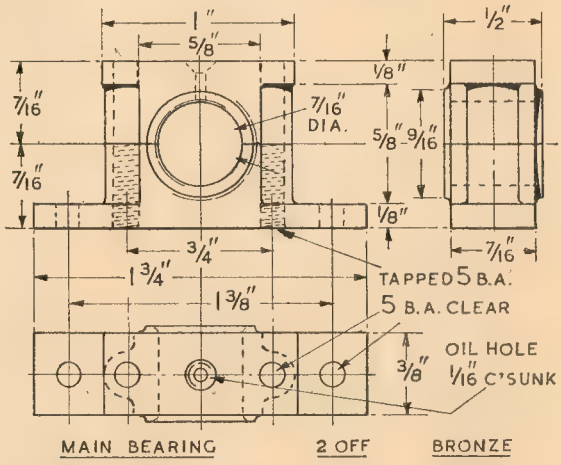
Not more than about 1/32 in. or so extra length need be left on the end of the shaft, seating for riveting over, and in order to avoid destroying the truth of the centre by hammering, a recess of the same depth may be drilled with a flat-ended drill about $\frac{1}{4}$ in. diameter. If the press fitting is good, only light riveting is necessary to make the web perfectly secure; the shaft should be well supported, preferably in a tube or bushing in the vice, with the end resting on the base of the gap. The shaft is then mounted between centres and the riveted end faced off, at the same time skimming up the outer face, and machining the inner face as already mentioned.

The crankpin can be pre-machined all over, and then fitted in much the same way as the main journal; very little riveting should be necessary, as this joint will not be subject to torque stress. Take care to avoid risk of distorting or bruising the end collar of the pin by inadequate support while riveting. The inner end of the pin can be faced off by mounting the shaft again between centres.

It will be seen that the keyway is shown at right-angles to the plane of the crankpin; this is not highly important, but in conjunction with the keyway position shown in the flywheel, it lines the crankpin up with one of the flywheel spokes, which is desirable for symmetry and neatness. The keyway may conveniently be cut after the crankshaft is assembled, using a small slotting cutter or a Woodruff cutter with a simple rig as described in the handbook *Milling in the Lathe*. Some constructors may have the idea of extending this keyway to enable the eccentric sheave also to be keyed, but this would involve running it right through the main bearing, which is not at all desirable.



TRUNNION BEARING 2 OFF BRONZE

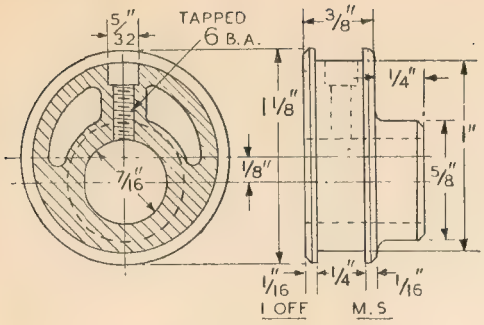


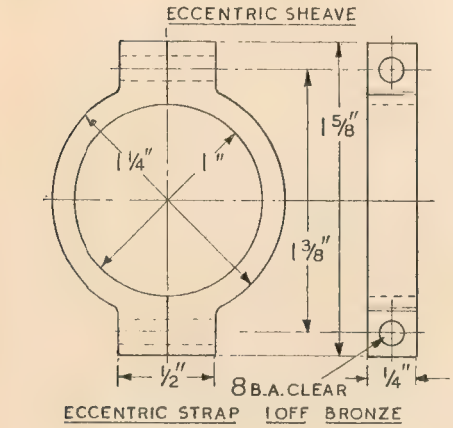
MAIN BEARING 2 OFF BRONZE

Main and Trunnion Bearings

The bronze castings may conveniently be cast in one piece, with allowance for the metal removed in splitting; they should first be machined on the base surface, then reversed for facing the top, taking care to keep this dead parallel with the base. A hole, well undersize, may be drilled through the bearing bore, to reduce the work entailed in subsequent operations. The positions of the stud holes should then be marked out and drilled, and identification marks made on the top and bottom components, to ensure that they are always assembled in the same juxtaposition.

Splitting may be carried out with a hand-saw, but I find it worth while to set up for using a circular saw in the lathe (there are four bearings in all which have to be dealt with, and may be split at one setting), as this reduces the risk of inaccuracy, and may even be arranged so as to dispense with the need for machining the contact faces of the halves afterwards. Otherwise they must be carefully set up, with the outer faces dead parallel with the chuck face, and trued up on the joint line so that they bed down properly.





Apart from dimensional details, there is no difference in the main and trunnion bearings, and they can thus be given identical methods of treatment. They are now assembled, with temporary screws to hold the parts together, and set up on an angle plate for boring the bearings. It will pay to drill the fixing holes in the base flange, and drill and tap holes in the plate for mounting them; a temporary plate made from angle-iron, such as I have often described, will not only avoid the need to mutilate a standard angle-plate, but will also suit light components of this type much better. When one bearing has been set up and bored, its companion may then be put in its place without the need for re-setting, and with the assurance that the two components will be a properly matched pair. They are bored on the exact line of the joint, and the end boss faced; it will probably be found worth while to true up the rest of the face as well. The reverse side is best dealt with by mounting the assembly on a mandrel.

Incidentally, it is not absolutely necessary to split the main bearings if a crankshaft with a plain parallel journal, as specified, is fitted, as it is possible to assemble the shaft by threading it through the bearings. The split bearings, however, provide greater convenience in assembly and maintenance; in view of the end collars on the beam trunnions, it is necessary to split the bearings for these, anyhow.

Eccentric Sheave

The term "sheave" is defined by lexicographers as equivalent to a slice or a disc, and was probably first borrowed by engineers from shipwrights, who used it to describe the grooved pulley in the shell of a block. This component, in early engines, was usually fitted to the square shaft, in the same manner as the flywheel. It was often made of cast-iron, which is equally appropriate for the model, but it will probably be more convenient to make it from mild-steel. Methods of making eccentric sheaves have been described in connection with previous engines; briefly, it may be said that there are two popular methods, the first by holding in the four-jaw chuck and machining the outer diameter and groove, then setting over to the required extent to centralise the bore, for the remaining operations. The second method consists of dealing with the bore first, or after roughing the outside, then setting it up on an eccentric mandrel for finishing the latter. In either method, the essential thing is to ensure that the two axes are exactly parrallel; minor errors of eccentricity, or "throw" are of less importance, as they can be allowed for to a limited extent in the valve setting.

I have specified the use of a sunk screw for fixing the eccentric on the shaft, as this method is generally preferred, in view of the problem of exact angular location when a key is used; as the screw is concealed on assembly, it cannot offend the eye, as would a screw fitted to the outer boss of the sheave. Piercing of the eccentric to lighten the offset mass is optional, but is in keeping with prototype practice, though in some cases the sheaves were recessed on the sides, leaving a centre web, instead of being pierced right through.

Eccentric Strap

This may be cast or machined from the solid, but in either case, it may first be bored undersize, then drilled for the bolts, before splitting. The contact faces are machined or filed dead flat and square, and temporary bolts fitted to hold the parts together for finishing the bore and facing the two sides to fit the sheave. If a fairly clean casting is used, it is not necessary to machine or file up the outside edge, except for the faces of the lugs, which should be squared up to provide a true seating for the bolts.

(*To be continued*)

THE ARKLEYWAY N.L.S.M.E. TRACK

(*Continued from page* 589)

It's rather peculiar how this track got there, and it all began in 1951, when some half-a-dozen fellows turned up and dug about 70 or 80 holes in the ground. Goodness knows what they were looking for, and as someone must have told them the proper place to dig holes was out in the roads, they departed and, for all we know, may well be still digging holes somewhere!

Someone then had a brainwave and said, "I know where there's a lot of holes that want filling up"—so filled up they were with concrete posts.

These looked a bit queer all on their own, so it was decided to link them together with more concrete in the form of beams.

By this time, this stupid crowd of chaps, covered in mud and concrete, were sitting down exhausted, when a small boy appeared and asked in a thin voice: "Are you building a model of Stonehenge?" "No, sonny, this 'ere's a loco track." "Blimey, guv., you must be 'loco'." So now you know what the term "loco" means. It's a description to fit a model engineer, whose nuts and bolts keep coming loose.

By this time, these fellows reckoned they'd spoilt the look of the field enough, and departed back to their angry wives.

But things didn't stay that way for long; oh, dear, no! Another crowd turned up one day, looked at the concrete, and one said: "You know, mate, if someone don't soon put some strap-iron round that lot it'll blooming well fall down!"

The problem was: if they let it fall down they might have to clear up the mess, and strap-iron being lighter to handle, they strapped it all up, and there it all stands to this day—a monument to what balmy things some men get up to. Can you imagine a bunch of women being so daft? You can? So can I.

For a proper idea of our track, the sketches are best.

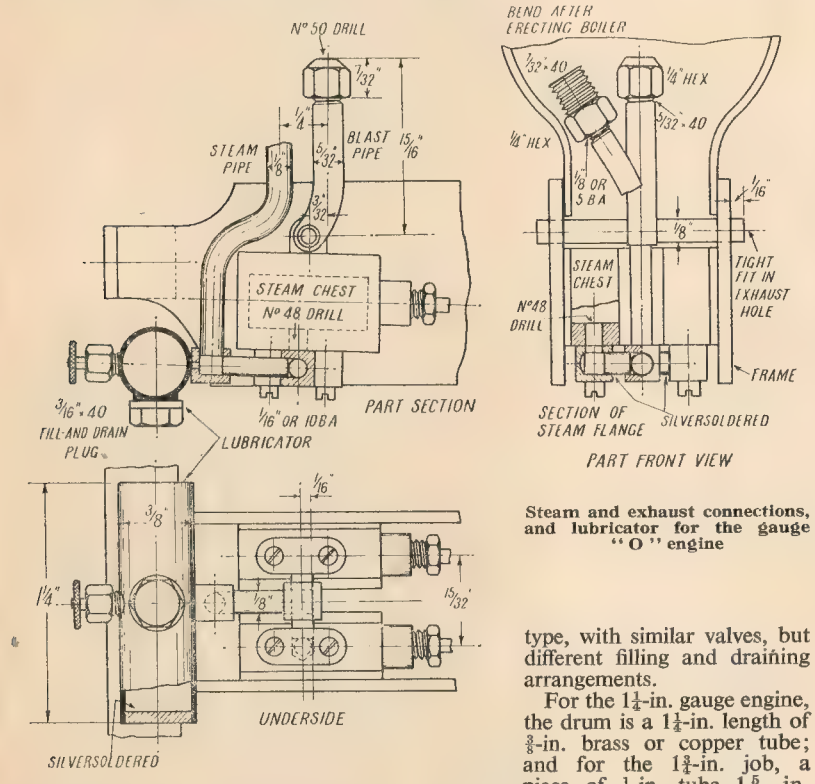
Afterthought: Some people think P.R.O. means Public Relations Officer, it don't, you know; it means—Paradoxical Recalcitrant Ogre.

L.B.S.C.'s "Netta"

FRONT END ARRANGEMENTS FOR THE SMALLER QUINS

THERE is an old saying that "second thoughts are best." Just at the moment, your humble servant's second thought is that if I don't give the 1¼-in. and 1¾-in. fraternity some job to get busy with, there will probably be a bit of a rumpus; so before carrying on with the reverse levers and other oddments for the link-motion engines, here are details and drawings of the steam and exhaust pipes, and the lubricators, for the smaller members of the family of quins. The first thing that will probably be noticed is that the drawings are a wee bit more, well, "comprehensive,"—shall we say ?—than those that I usually offer; but I don't imagine that builders will have any difficulty in following them. My sole object was to get as much informative detail as possible into the space available, so that there would be plenty of work to carry on with, while I am dealing with the larger engines. O.K. ? Right, let's go.

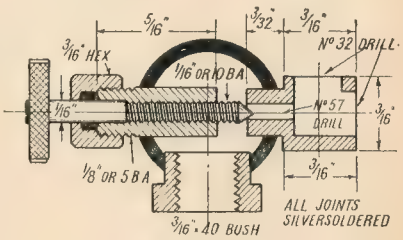
To make the job as simple and easy as possible, I am specifying hydrostatic or displacement lubricators in the two smaller sizes; and as both are provided with regulating valves, there should be no difficulty in giving the cylinders the required amount of oil. The feed isn't as regular as that supplied by a mechanical lubricator, I freely admit; but as long as the valves and pistons get sufficient, that is all you need worry about. Both lubricators are of the drum type, with similar valves, but different filling and draining arrangements.



Steam and exhaust connections, and lubricator for the gauge "O" engine

For the 1¼-in. gauge engine, the drum is a 1¼-in. length of ⅜-in. brass or copper tube; and for the 1¾-in. job, a piece of ½-in. tube 1 5/16 in. long. Both are squared off in the lathe, and the ends are closed either with discs of 16- or 18-gauge sheet metal, or thin slices parted off a rod. Slightly countersink the ends of the tube before pressing in the discs, as this forms a channel for the silver-solder to flow into. Right across the centre of the smaller tube, drill a No. 32 hole; and in what will be the bottom, drill a 7/32-in. hole. Across the centre of the larger one, drill a No. 32 hole, but enlarge it on one side to 3/16 in. Above, drill a ¼-in. hole for the filling tube; and below, a No. 32 hole for the drain pipe, these being merely bits of tube, screwed at the end as shown, and fitted after the valve job.

Both valves are alike, and are made in two pieces. The smaller one is a 5/16-in. length of ⅛-in. brass rod. Chuck in three-jaw, centre, drill through with No. 55 drill, open out to a full 1/16 in. depth with No. 51 drill, and tap the remainder either 1/16 in. or 10-B.A. Screw about ⅛ in. of the outside, either ⅛ in. or 5-B.A. Make a gland nut to suit, from 3/16-in. hexagon brass rod, drilling it No. 51 for the valve-pin. The latter is a bit of 1/16-in. rustless steel or hard bronze rod (or, rather, wire !) pointed at one end, screwed to match the thread in the valve body, and furnished with a weeny hand-wheel about ¼ in. in diameter. For beginners' benefit, I'll repeat that the point needn't be turned, but can be formed by sweeping a fine flat file, held at the approximate angle shown, across the end of the bit of wire held in the three-jaw, while the lathe is running as fast as possible without rocking the workshop. I've given instructions many times, for turning the handwheels, so need not repeat them here. If these tiny specimens are screwed on to the spindles, and the end of the screw slightly burred over, so that the wheel can't come unstuck, it will save filing squares on the spindles, and punching square holes in the wheel bosses.



SECTION THROUGH LUBRICATOR VALVE

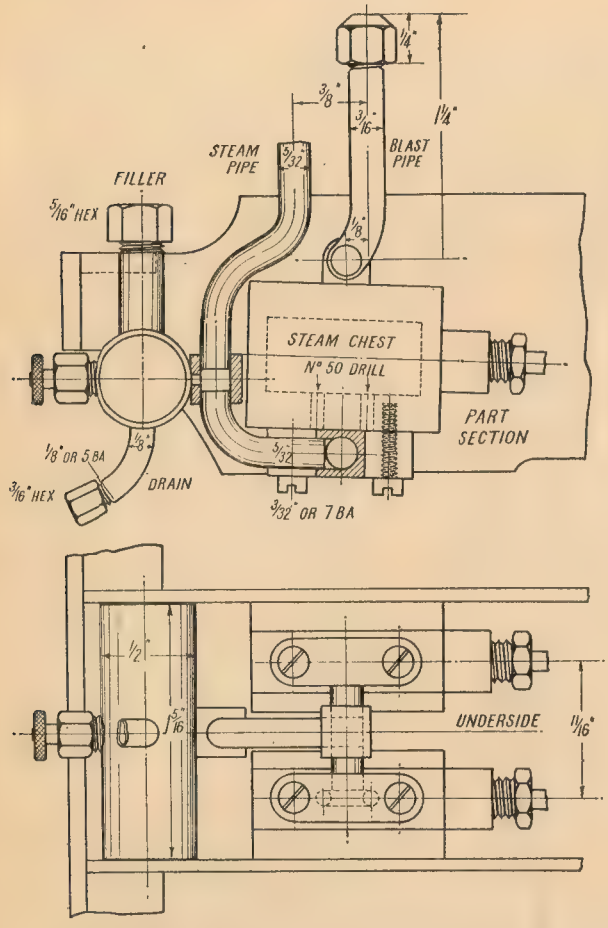
The valve for the 1¾-in. gauge lubricator is made in the same way, working to the sizes shown. The body is made from 3/16-in. rod, drilled No. 48 and tapped 3/32 in. or 7-B.A., the end being screwed 3/16 in. × 40. The gland nut is made from ¼-in. hexagon rod, and the valve-pin from 3/32-in. rod. Both

valve bodies are squeezed into one side of the cross-hole, as shown, as far as the external thread.

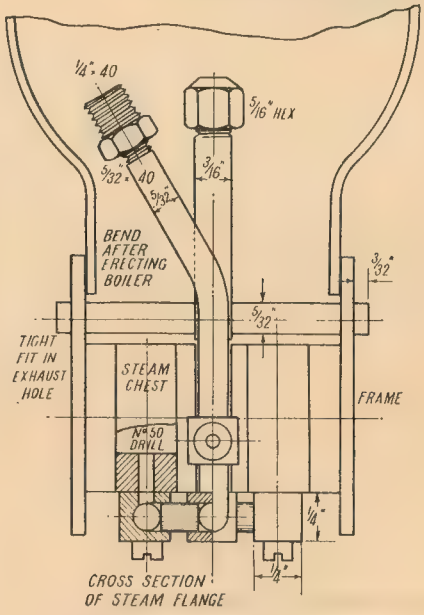
The combined pipe-connection and seating is made from square rod. To make the smaller one, chuck a piece of $\frac{3}{16}$-in. square brass rod truly in the four-jaw, face the end, centre, and drill down to 5/32 in. depth with No. 32 drill. Part off at 9/32 in. from the end. Reverse in chuck, and turn down 3/32 in. of the other end to a tight fit in the hole opposite the valve; centre, and drill full $\frac{1}{8}$ in. length, to fit the hole in the drum, centre it, and drill down about $\frac{1}{4}$ in. depth with No. 53 drill. Part off at $\frac{1}{4}$ in. from the shoulder, then drill a hole with No. 23 drill, clean through the block, cutting across the hole in the pip. Fit to drum as above. The bush for the filling plug in the smaller one, and the filling and drain pipes in the larger one, can then be fitted, but don't silver-solder them yet.

and two holes drilled in each for the fixing screws, with No. 51 drill. In one of the sides at right-angles to the screw-holes, drill a No. 32 hole about three parts through; then, on the same face as the screwholes, drill a No. 48 hole, breaking into the one just drilled.

The flanges for the 1¾-in. engine are made from ⅜ in. lengths of ¼-in. square rod, rounded off and drilled No. 41 for screws. The side hole is drilled No.



Steam and exhaust connections, and lubricator for the 1¾-in. gauge engine



Part front view of pipe assembly

with No. 57 drill until it breaks into the other hole. In one of the facets, drill another No. 32 hole, breaking into the first one at right angles, as shown in the section. Squeeze this into the cross-hole opposite the valve, and see that it goes in fair and square, so that the valve-pin, when screwed home, enters the end of the 57 hole as shown in the section.

The corresponding part of the 1¾-in. gauge lubricator is made in similar fashion, from ¼-in. square rod, but the end of the square block isn't drilled. Chuck the rod truly, turn the pip to a

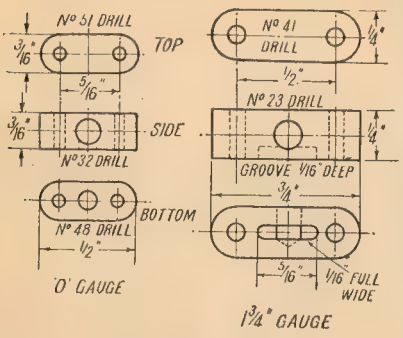
The steam pipe on the 1¼-in. engine is a piece of ⅛-in. copper tube approximately 1½ in. long, with a few ⅛-in. or 5-B.A. threads on the end. That for the 1¾-in. engine is of 5/32-in. pipe, about 1¾ in. long, the end being screwed 5/32 in. × 40. Squeeze the ends into the upper holes in the valve-seat blocks, as shown, but leave the pipes straight for the time being.

The next job is the flange assembly, and this will need a little care. The flanges for the smaller engine are made from ½-in. lengths of $\frac{3}{16}$-in. square brass rod, the ends being rounded as shown,

23; but instead of a single hole in the contact face, drill two $\frac{1}{16}$-in. holes about $\frac{1}{16}$ in. deep, at ¼ in. centres. Either end-mill or chip a groove between these, deep enough to break into the side hole, as shown in the detail illustration. The quickest way to do this is to clamp the flange on its side under the lathe tool-holder, at centre height, and traverse it across a $\frac{1}{16}$-in. slot drill or a dental burr, held in the three-jaw. True up all the contact faces same as described for slide valves, by rubbing them on a bit of fine emerycloth laid on a flat surface.

The junction blocks which go between the flanges, are pieces of the same material as used for the flanges. The larger is drilled No. 23, and the smaller No. 32. First, drill clean through, then drill the second hole at right-angles, breaking into the cross-hole. The blocks are joined to the flanges by very short bits of pipe, as clearly shown in the illustrations, so that when assembled, the centre-lines of the 1¼ in. flanges are 15/32 in. apart, and the 1¾ in. flanges are 11/16 in. apart. Aha—did I hear somebody say, why go to all that trouble, when the whole bag of tricks could be cut from a single block of brass, without any joints at all? Of course, it could, and anybody who likes to do the job

that way is quite welcome to do it, but there is a wasp in the jampot. It is a million dollars to a pinch of snuff that the undersides of the steamchests won't be exactly dead in the same plane ; and unless they were, a blow would soon develop in the joint between the contact



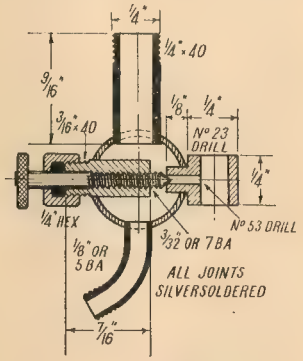
Steam-pipe flanges

face of the flange, and the steamchest to which it is screwed. With the arrangement specified, there is just enough flexibility between the two flanges to enable each one to bed home to its seating on the underside of the steam chest, even if the latter are slightly out of line, when the screws are tightened down " for keeps."

On the 1½-in. gauge engine, connection is made between the junction block between the flanges, and the valve-seat block on the lubricator, by a straight piece of ⅛-in. copper pipe, ⅜ in. long. On the 1¾-in. job, the pipe is 5/32 in, diameter, and formed into a right-angle bend, as shown in the side view. Although I have a rod and tube bender, I always make these bends with my fingers, putting a bit of steel rod in the end of the tube, to give a little extra leverage (couldn't do it if I went in for catsclaw fingernails !) and the job is easy enough if the tube is softened before attempting to bend it. The bend is cut to length as shown, and fitted to the junction block between the two flanges, and the block on the lubricator drum.

The whole complete assembly, lubricator, pipes and flanges, can then be silver-soldered at one heating. Just anoint all the joints, and the ends of the lubricator drum, with wet flux, heat the lot to medium red, and touch all the joints with either a narrow strip of best grade silver-solder, or better still, a bit of Easyflo wire. If the latter is used, don't forget that the best flux for the job is that sold for use with it, which washes off readily and leaves a lovely clean job. I've no shares in the company—if I had, I shouldn't be doing this weekly penance—but I *do* love to see nice clean tidy joints. I nearly forgot to mention that the valve pin and the gland nut should be removed before doing the silver-soldering job, but I guess that the good sense of those who follow these notes will already have told them all about that. Let the job cool to black, then quench out in acid pickle, wash off and clean up. Let the water run freely through all the pipes and the inside of the drum, to remove every trace of flux and acid.

On the 1½-in. gauge engine, the No. 48 hole for steam entry is drilled in the underside of each steam chest, 5/16 in. from the front end, on the centre line. The flanges are attached to the steam chest by two $\frac{1}{16}$-in. or 10-B.A. screws in each, the hole in the underside of the steam chest corresponding exactly with the hole in the steam flange. In this position it will be found that the holes for the fixing screws are quite clear of those holding the steam chest to the cylinders. The steam hole will cut partly into the hole for the centre bottom screw, but that doesn't matter a bean ; and it is unavoidable, anyway, in such cramped quarters. No steam can escape when the screws are tightened home. Anyway, we have dodged that in the second quin, as she is a bit larger, and we have more room to play in.

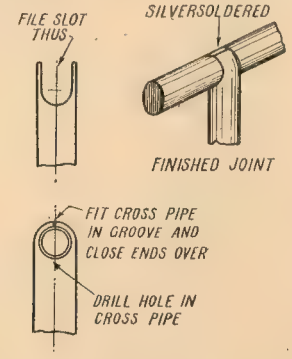


Section through lubricator valve

After setting the flanges in correct position, clamp temporarily, run the No. 51 drill through the screwholes, making countersinks on the steam chest wall, follow with No. 55, and tap $\frac{1}{16}$ in. or 10-B.A. Remove any burring ; and when assembling on the final stage, a 1/64 in. jointing gasket, made from Hallite or any other good jointing material, can be placed between the flange and steam chest.

The actual erection procedure is pretty much the same on the 1¾-in. gauge engine ; but, in this case, we can use two No. 50 holes for letting the steam into the steam-chests, thus dodging the middle bottom fixing screw of the latter. Drill these on the longitudinal centre-line of the steam chests, at ¼-in. centres (⅛-in. above and below middle) and they will miss the screwhole altogether. Now set the steam flanges so that the grooves in the undersides, or contact faces, cover the holes, as shown by dotted lines in the underside view. The assembly can then be attached to the steam chests by two 3/32-in. or 7-B.A. screws in each flange, by exactly the same procedure as described for the 1¼-in. gauge outfit. The upper steam pipes can then be bent to the outlines shown, and union screws fitted to the ends, for connection to the superheaters. The smaller one is made from ¼-in. hexagon rod, and screwed 7/32 in. × 40 ; the larger, from $\frac{5}{16}$ in. hexagon rod, and screwed ¼ in. × 40. The caps for the filler and drain pipes, and the plug for the combined filler and drain on the smaller drum, are made from hexagon brass rod and need no detailing. The glands can be packed with a strand of graphited yarn. The drums need no support, other than that afforded by the pipes ; the 1¼-in. projects beyond the frames at each side, to afford extra oil capacity, but the drum on the 1¾-in. job should fit nicely between the frames. When the upper steam pipes are connected up to the superheaters, the drums will be held quite firmly ; and should it be necessary to remove them at any time, the whole doings can be got out as a single unit, simply by unscrewing the union nut and taking the screws out of the steam flanges.

By the good rights, I should have described the exhaust pipes before the steam pipes, as one of the cylinders must be temporarily slacked back to erect each ; the reason being that I have eliminated screwed connections altogether in these components. While pipes with unions or running joints as used by plumbers and gasfitters are all right under certain conditions for larger engines, in the smaller ones they are, to be quite frank, just a darned nuisance, especially when they are not get-at-able. I am therefore specifying a plain cross pipe, with the blastpipe permanently attached to it, erected



How to make the exhaust pipe joint

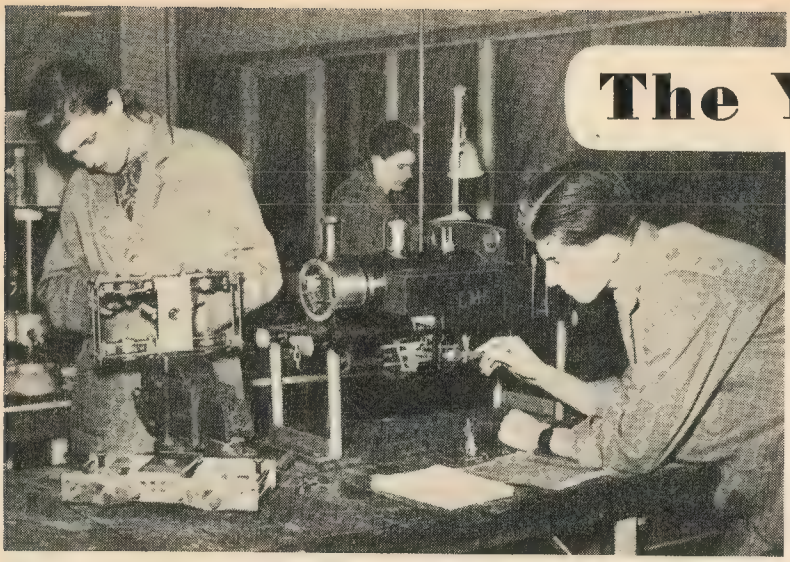
simply by pushing the ends of the cross pipe into the corresponding holes in the cylinder bolting flanges.

An arch-shaped opening is filed in the upper edge of each steam chest opening in the frame, and this should be large enough to allow the cross pipe to enter the hole in the bolting flange; see illustrations. The cross pipes are long enough to enter the smaller cylinders a full $\frac{1}{16}$ in. at each side, and the larger cylinders a full

(*Continued on page* 601)

The Young Idea at Hoovers

By
J. Dewar McLintock



Apprentices following a model engineering hobby at the Hoover Ltd. Training School

YOUNG engineers are no less human than their fellows. They may, indeed, be more human, because a certain sensitivity may go hand-in-hand with their receptive mental attitude. That being so, they are affected in varying degrees by their environment, and by the form and rhythm of their activities.

It is clear that this has been appreciated by Hoover Ltd. in the formulation and planning of the current scheme for craft and student apprentices, who are destined to take up such trades as toolmaking, machine tool fitting and electrical engineering, following a five years course.

Each spring, perhaps 15 new boys are selected carefully for training, and thus at normal times there are about 70 boys at some stage of training in the scheme as a whole. Now, these boys may come from any part of the kingdom. They may be gentle or a little rough, shy or forward, happy or sad, and all that they have in common may be their scholastic abilities, and a love of things mechanical.

This could be very brittle, almost explosive material, but under the system instituted by Hoover Ltd., and by virtue of guidance from carefully chosen instructional staff, it becomes ductile within a remarkably short time.

Those things known on the wider scale as works relations, welfare, etc., are applied to the apprentice establishment in much the same way as they are to the main factories of this great organisation, but there is more to it than that. Many of these boys are far from home, perhaps for the first time, and almost all are just a little bit on the defensive, at least for a week or two. But at the Hoover school they are lucky, because every effort is made to put them at their ease, at the same time as gentle but powerful efforts are made to assist their growth of character, and impose a reasonable degree of discipline.

I think it is safe to say that Hoover apprentices can respect their instructors without any conscious effort. I spent most of the time, during my visit, with chief instructor F. C. Williams. Initially, however, I met Mr. K. M. Jones, from Porthcawl, who has recently been appointed education and training officer, and is in full charge of the training school at the Perivale factory. Mr. Jones took a degree in chemistry at the Imperial College, London, took an active part in college rowing, was a fighter pilot and a prisoner of war. After the war he studied personnel management and later went to Edinburgh as a science master. My impression was that he is the kind of chap most people would be glad to work for.

Candidates are selected from grammar, technical and secondary modern schools. Passes in English, mathematics, and physics in the General Certificate of Education, or the completion of the full course at a technical school, or the extended technical course at a secondary modern school are an advantage. Naturally, attention is paid to evidence of practical interest and ability in wood and metal work. There are occasional openings for boys of special ability who have stayed at school until the age of 18.

The first year of instruction is given in the trade school, which is a self-contained section of the Perivale factory, and with which this present review is mainly concerned. In this well-equipped school, the lads are given intensive experience in bench fitting, turning, milling, grinding, welding, draughtsmanship, etc. There are also many theoretical periods and lectures.

Throughout the five years of indentured apprenticeship, one day of the five-day working week is spent at a technical college. The majority of apprentices are expected to take the three Ordinary National Certificate examinations in mechanical or electrical engineering during their first three years, and to follow this with two years of study for the Higher National Certificate in these subjects.

Exemption from national service is usually granted until the end of the apprenticeship if satisfactory work is being done. A few apprentices who have made exceptional progress in their studies have been given the opportunity of a diploma course in engineering, of the sandwich type. In such a case, six months are spent in the factory and six months at a technical college. A few apprentices have been able to take the advanced-level General Certificate of Education examination and, having gained county major awards, or technical state scholarships, have proceeded to a university for whole-time study.

The remaining four years of the course are spent under a carefully planned order of practical experience in many parts of the factory. This is adjusted in some measure to the individual needs of the pupil and to the trade followed. For instance, an apprentice toolmaker will spend a large part of his time under instruction in the toolroom but will also visit the tool drawing office and production engineering departments.

During training, it is usual for apprentices to spend some months in outlying factories, whilst a certain number are sent to the continent on apprentice exchange schemes. Apprentices work 44 hours a week and are paid on a scale which increases with age from 1s. 6d. to 3s. 7¾d.

After the course, the lads usually do their national service, and, during this period, the company keeps in touch with them by letter, and sends house magazines, Christmas gifts, etc. The boys are encouraged to visit the factory during periods of leave.

There is no obligation on apprentices to continue their services with the company, but most of them do so, and a number have risen to be technicians and to hold supervisory positions. The background of an engineering apprenticeship is regarded as a very satisfactory foundation for promotion within the company.

I was naturally interested in the syllabus of work in the school at Perivale, and I studied this on a wall

chart before making my rounds of the benches and machines.

As might be expected, it is arranged so that new apprentices begin with elementary work which increases with degree of difficulty throughout the year. Practical exercises and the lecture programmes are dovetailed together. The apprentices begin elementary exercises on machine tools coincidentally with bench work, partly to aid the arrangement of the syllabus and partly to add additional interest; this is found to be sound practice, provided care is taken to see that the exercises with the machines are kept within the boys' ability.

Naturally, this system means a little more planning and work for the instructors, but they are keen enough to take it in their stride.

While test pieces, as in all apprentice schools, have to be completed by the boys there is a strong accent on useful and interesting work. For example, an apprentice motor mechanic when working in the training school has been given work involving brazing and welding skills which will be useful in his future work. The school takes on a variety of interesting little jobs which may be connected with the development work in the factory (note—*not* production work) or may be a maintenance assignment.

At the time of my visit, for example, students were currently working on the sectioning of vacuum cleaners for display and instructional purposes. This gives good training in accurate measurement, cutting and filing, and a certain amount of electrical instruction, and students who have only been at the job for a few months appear to get professional results. Others were working on a simple but ingenious device designed to keep under control the cable attached to an electric mower used on the pleasant and spacious lawns which surround the factory.

Since so many of these lads are destined to be toolmakers, the instructors welcome little jobs involving "runs" of certain articles. Some time ago, a customer of the company wanted a few hundred of some fairly simple small steel pressings. A group of boys made up the necessary tools for piercing and pressing, and production went off with a fine swing. The customer concerned was delighted, and subsequently asked if he might have the tools on "permanent loan."

Boys are also encouraged to exploit their own hobbies where applicable, and a model locomotive enthusiast, for example, would soon find himself combining work with pleasure, consistent with his keeping to the requirements of the syllabus.

The school is a self-contained annexe to the factory, and comprises workshops and stores, lecture rooms, library, administrative offices, film projection room, etc. All these departments are attractively modern and congenial, and there is generous window space, particularly in the workshop. The shop is spacious and the equipment includes eight centre lathes, one capstan, three milling machines (horizontal, with vertical milling attachments), rotary and pedestal surface grinders, a two-station welding bench, coal-gas welding outfit for aluminium welding, brazing hearths, four drawing desks and boards, with drafting machines, etc., and, of course, hand-fitting benches.

I naturally enquired about selection methods, and was not surprised to learn that these have been most carefully studied and developed. The proportions of rejections of the 60 odd annual applications may be as high as 75 per cent., and, incidentally, the technical and secondary modern schools are now tending to produce more successful applicants than the grammar schools, although this was not formerly the case. Many people will feel that this is just as it should be.

Candidates are interviewed by Mr. Jones and his instructors and there are, of course, suitable examinations in mathematics and English. Selection is based not merely on actual results, but on assessments of the boy's character and suitability. Considerable value is also attached to standard mechanical aptitude tests, to determine whether candidates have the type of intellect which allows them to grasp mechanical matters fairly easily. Headmasters' reports are called for and considerable weight is attached to these.

Before I left, I had an opportunity to get Mr. Williams talking "off the record," and I found him every bit as enthusiastic and full of engineering and training topics as he had been during our official interview. I was left in no doubt that the instructors really have the interests of these lads at heart, and, as Mr. Williams said, they derive the greatest satisfaction from seeing them in many cases grow into well-educated and quite worldly young men, as well as engineers.

Left: A general view of the Hoover Ltd. training school for engineering apprentices at Perivale, Middlesex

Below: The chief instructor, Mr. F. C. Williams, helping a young apprentice

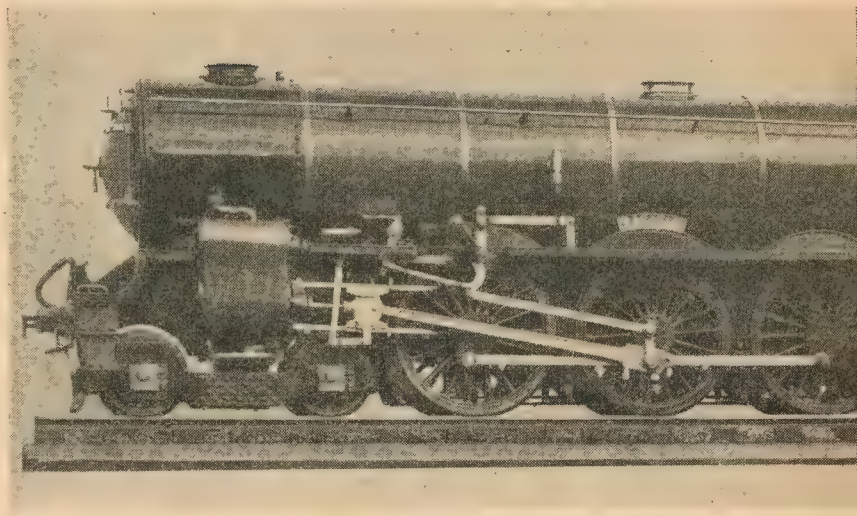
A Fire- and Water-tu

By G.

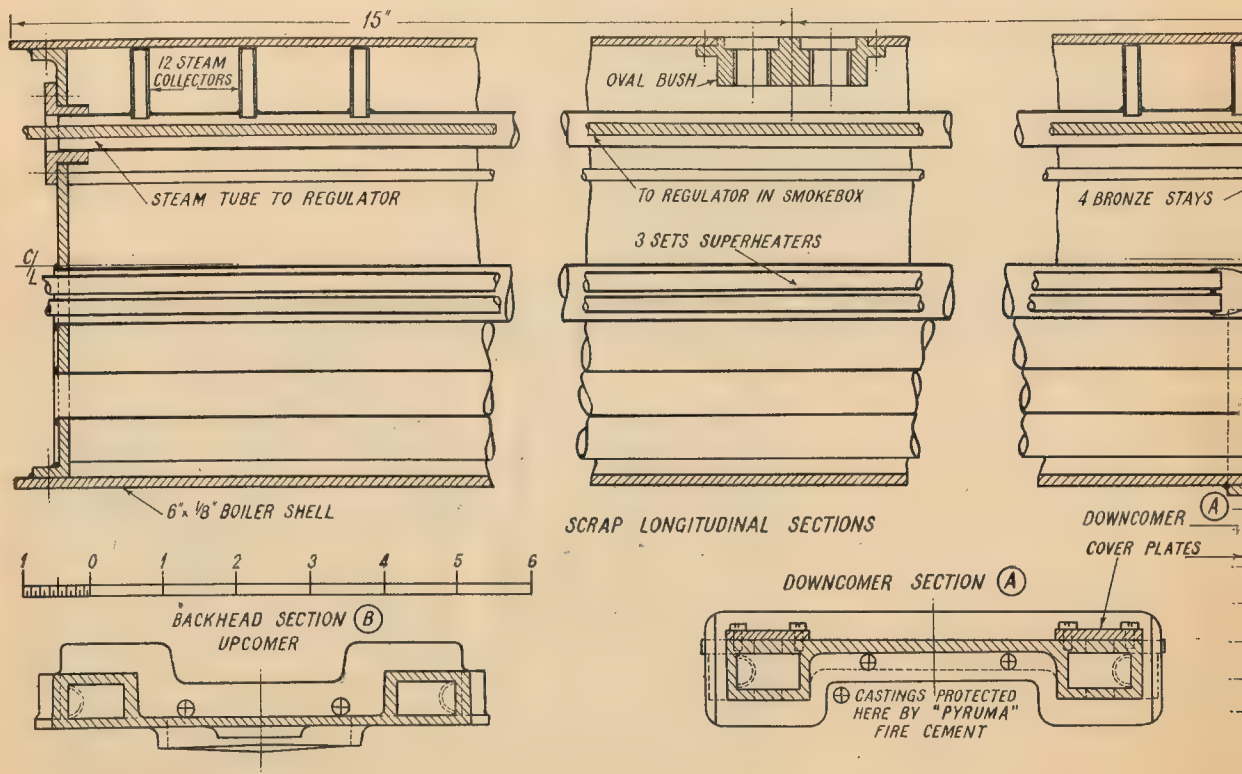
THE locomotive illustrated was completed in 1951 ; it is a "Pacific" type and was awarded the M.E. prize at a local exhibition. It is a large affair and is fitted with a combined fire- and water-tube boiler, 6 in. dia. by 32 in. long, and it was only possible to fit on a chimney $\frac{9}{16}$ in. high to keep within the loading gauge of 1 in. to 1 ft. scale. But I am not going into details of this, as so many have been detailed and described in THE MODEL ENGINEER by more able pens than mine. As a great amount of local interest has been shown in this boiler, I thought other readers would like to see a few notes and sketches of its design. These should not be taken as building instructions.

When I designed this boiler, I was aware that castings would be involved in its construction, and there would be no alternative if I wished to carry it out. Briefly, the parts involved consisted of main boiler shell, fire-tubes, water-tubes and nine castings.

The patterns and core-boxes were first put in hand ; then a suitable non-ferrous foundry was contacted as near home as possible to discuss a suitable mixture of metal and supply the necessary castings. The following mixture was recommended : 88 copper, 10 tin and 2 lead, no zinc to be used. While awaiting the castings, work was commenced on the boiler shell ; this consisted of $32\frac{1}{2}$ in. of 6 in. dia. seamless

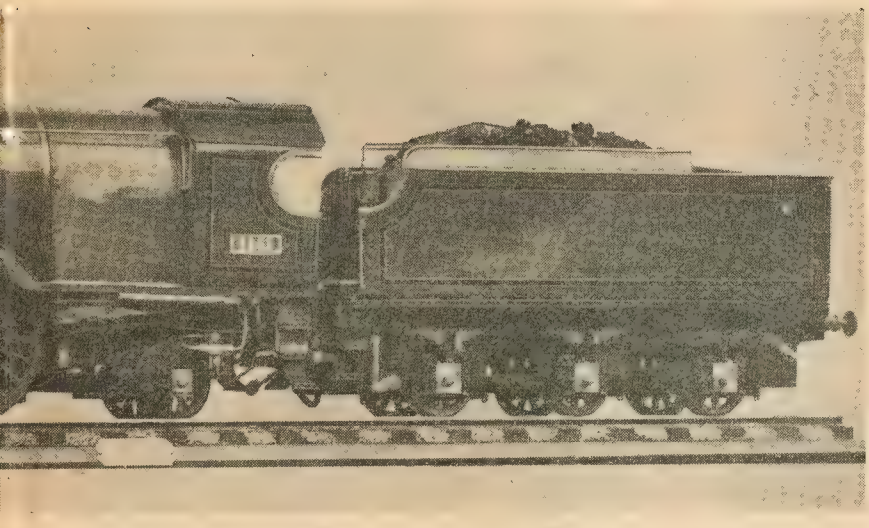


The 1-in. scale 4-6-2 locomotive for which the bo



ıbe Locomotive Boiler

Essex

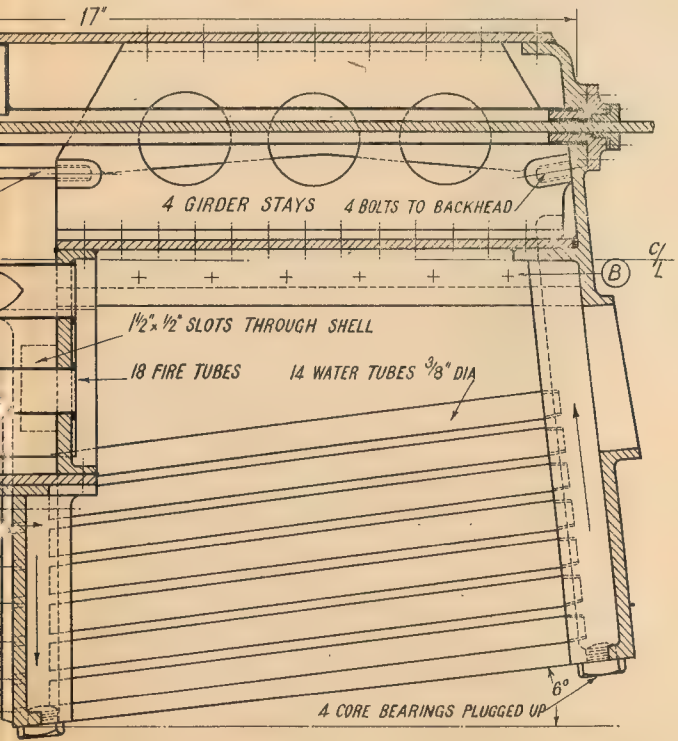


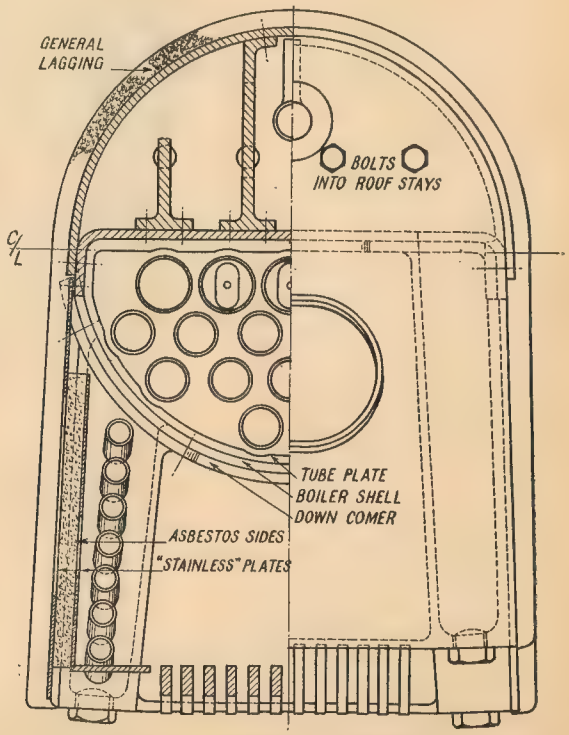
oiler described by Mr. Essex was designed and built

copper tube ⅛ in. thick. On a surface plate, a line was scribed each side of the tube ⅜ in. below the centre-line, 7 in. from one end of the tube ; then, with the tube stood up on end, the 7 in. line was scribed around same to intersect the other lines, and two small holes were drilled to saw to. The portion was now sawn away, 7 in. long × section of the tube ⅜ in. below the centre-line ; this was the firebox end, so, by cutting off ½ in. of the remaining end of tube, this made the piece already cut out suitable for the firebox roof. Further, the end was finished off at 6 deg. to give the backhead upcomer a slope when assembled. Other work on the tube consisted of cutting out two openings 1½ in. × ½ in. to match up the water-ways in the downcomer throatplate casting when assembled, and an oval hole was cut out on top of shell for a bush casting to take a pair of safety-valves.

When the castings arrived, work started in earnest by filing up all over to locate any defects before any further work or time was wasted. A defect was exposed in the backhead upcomer but the casting was replaced. The water-ways in both upcomer and downcomer had special attention, internally, to make them smooth with a square file.

Girder stay castings were four in number, two being full height to shell





(centre ones), the others (outside) being curtailed in height. Work consisted of filing bases flat and drilling flanges at ½ in. pitch for rivets. Bosses at ends of castings were drilled and tapped, one end being secured to backhead, with bronze hexagon screws the other end for longitudinal bronze stays extending to front tube plate on assembly.

Bush for Safety-valves

This casting being oval required careful hand filing, to fit the opening, as mentioned, in top of shell, set up bored and screwed 0.650 in. × 19 t.p.i. at 1 in. centres and faced off ; it is secured inside the shell and brazed up outside.

Tubeplate, Firebox End

Again this consisted of a casting, as it would be difficult to work up in copper plate. Work consisted of setting out for fire-tubes and drilling small holes at this stage. The front tubeplate was drilled also, using the back one as a template. The machining was now carried out by bolting the casting on to faceplate, the flat flange being set out the necessary amount above the centre-line so that the radius portion could be machined to the internal shell diameter of 2⅞ in. radius. The flat flange and the corners to suit firebox top-plate were hand-filed. The next operation was the setting up for boring tube holes. A piece of steel is turned to fit the mandrel nose and reduced down in diameter to form a peg to fit the holes drilled when the faceplate was in position. The casting was then put on the peg and secured; the faceplate was removed to take away the peg and the boring proceeded with for a tight fit for the tubes. Before removing the casting, a light cut was taken across it a little way to help in forming a filler when brazing up the tubes. Where the tubes came close to the flange, an actual radius was cut and this operation had to be repeated for each tube.

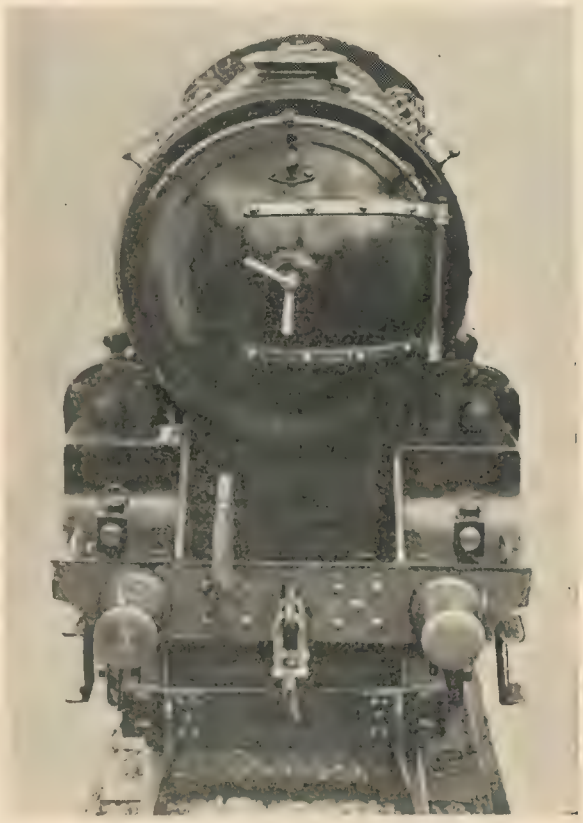
Tubeplate, Smokebox End

This could be worked up in copper plate, but such material was difficult to get when the boiler was built; so while the previous patterns were being made, one was turned up for the smokebox tubeplate and, allowing for a skim all over, the diameter was finished for a tight fit in shell. The casting was now set up for boring for all tubes as in the firebox tubeplate; in addition, a slight countersink was formed to assist in assembly. Holes were drilled and tapped for stays and steam tube to regulator, together with the necessary bushes for securing. The bush for steam tube required a large flange to carry the regulator which is in the smokebox.

Backhead Upcomer

This casting was fitted to the end of the tube by hand-filing so as to lie at 6 deg. and a few screws put in to assist it to do so when it came to brazing.

The two water-ways were set out at ½ in. pitch to tapping size for the ⅜ in. diameter; these, resting in the mould, were produced by prints on the pattern to locate the main core and come through the base of the casting. They are drilled and tapped ¼ in. × 26 t.p.i. for plugs, which can be used for washing out purposes when necessary.



A nice impressive front end

Throat-plate Down-comer

This casting is machined to assemble to the shell so that the water-ways in it match the 1½ in. × ½ in. slots cut in the boiler shell. Machining was done by clamping it to an angle-plate on the slide in the lathe, while a tool was bolted to the faceplate to form a 3 in. radius. The two waterways were marked out for drilling, as in the backhead, but they were drilled right through the casting, as, in this case, the ⅜-in. tubes are finally put through these, on assembly, to screw into the waterways in the backhead. These holes required care, as it was necessary to drill them at 6 deg. from vertical. Two flat plates were now suitably drilled to cover and seal with " Hallite " jointing, fourteen ⅜-in. holes on the outside after the tubes were finally in position.

The two core holes at the base were drilled and tapped for plugs, as was done in the backhead; these, being at the lowest level in the boiler, are very convenient for fixing a blow-down valve.

Firebox Roof

The 7 in. piece cut away from the shell was annealed and flattened out. A flange was formed ¼ in. radius ⅞ in. deep on the 7 in. side. and surplus cut off the other side and flanged to make the piece 5¾ in. wide. I would add that the forming of the flanges was not made quite square within 3 deg.

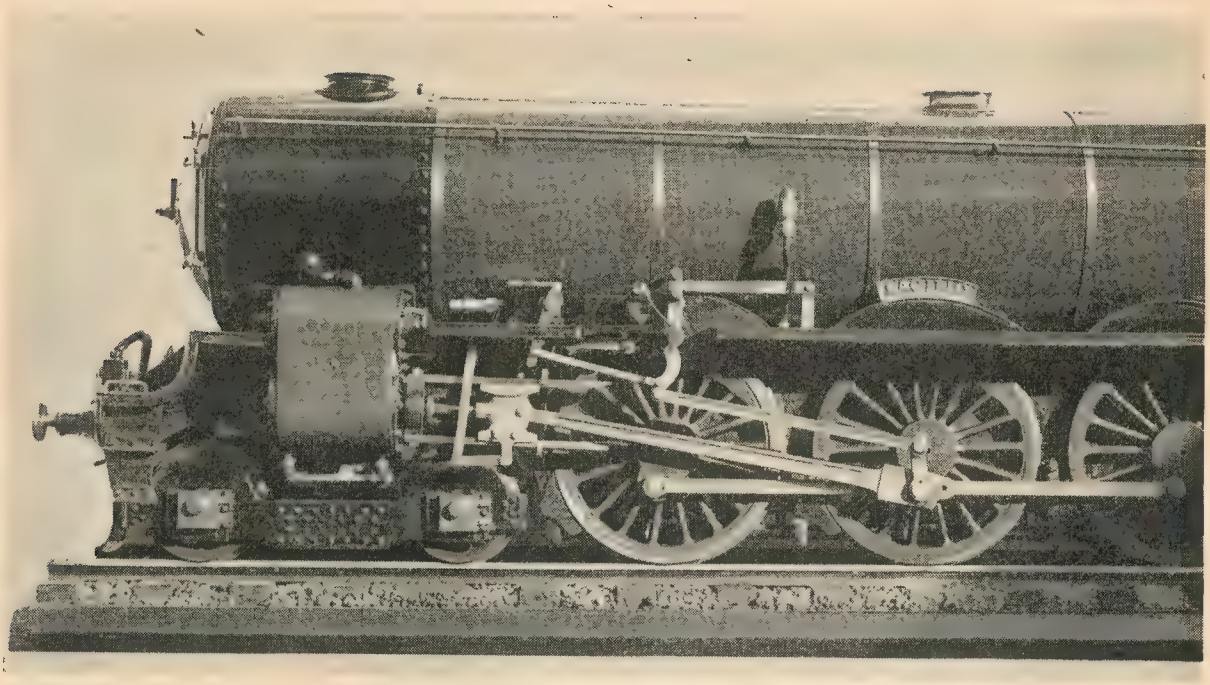
Assembly Notes

As seen on the drawing, a flange at the rear of the backhead carries the firebox roof and had to be slightly undercut so that, when riveted up, the backhead casting would conform to 6 deg. slope. The two roof-top pieces were cut away to match the water-ways on the backhead when riveted and brazed up.

The roof stays were now added, the two full-depth ones being put on first to line up with the holes in backhead, secured with bronze hexagon screws and riveted to the firebox roof.

The two shorter stays were now added and riveted on in alignment for backhead fixing as the others. To fit the tubeplate, careful filing was required to fit the roof top, as the ⅞-in. flanges on it were to be let in flush to form a continuation already machined. A few rivets were put in between the girder stays when this was brazed up. All this now formed a unit comprising backhead, roof, tube plate and roof stays, and could be fitted up to the boiler shell for assembly.

It was now necessary to splay out the side portion of the shell where sawn down ⅜ in. below centre-line to fit the firebox roof flanges and also the two deep girder stays to meet the top of the shell. The necessary holes in the shell were drilled, the unit put in for marking-off, using bronze countersunk screws for backhead and tubeplate flange, and rivets along the roof flanges to shell. The brazing of this unit in the shell was assisted by the heating



Close-up of front end, showing detail of valve-gear

up of same on a forge, to which I had access, and I found it helped a great deal.

The fire-tubes were next fitted according to instructions which have been so often repeated. The four longitudinal stays were screwed into the roof stay castings, the main steam tube with its number of collecting tubes, the boiler and tubeplates were put in, kept in position with a few rivets and brazed up.

The throatplate downcomer was next; this was machined a close fit to the shell, the holes were drilled and marked out on the shell, checking up its position with the backhead and the slots in shell, securing it with countersunk screws and silver-soldering round the flange.

Before assembly of the water-tubes, a preliminary water test was carried out, because, to get at the tubeplate and firebox joints if anything should require attention after they had been assembled, would be very difficult. This test was carried out by covering the tube holes in water ways with sheet rubber, clamping on steel plates and plugging up other holes.

The fourteen $\frac{3}{8}$-in. water-tubes were now prepared by cutting to lengths, screwing fine threads on one end and annealing the other end. A long tap, about 10 in. long, was now made up and passed through the holes in the throatplate downcomer, to tap the holes in the water way in the backhead. The tubes could now be threaded through the downcomer and screwed into position in the upcomer. As I expected, it was found necessary to increase the diameter of holes in the downcomer to compensate for any slight error in alignment to the upcomer tapped holes; when the tubes had been screwed into position, the ends were expanded and finally silver-soldered. The cover plates were now screwed on, using " Hallite " jointing to make good where the holes are in downcomer. This also facilitates any future cleaning of the tubes which may be necessary.

The boiler was now ready for final hydraulic test and was run up to 280 p.s.i. pressure. To complete boiler, double plates with asbestos between were made to lie on the firebox sides and held in position by studs and nuts. To make air-tight, these plates are sealed in position with fireclay at the joints in the recess, where boiler shell is jointed to firebox roof return edges, and on the sides of downcomer and upcomer castings. Over this, the general lagging of asbestos was added for the whole of the boiler.

Water capacity of the boiler at working level is 10 pints, that of the tender for the locomotive being 16 pints. Steam is raised from cold to 25 lb. in 8 min. by a 4 in. diameter fan; the blower then takes over and raises pressure to 90 lb. in a further 5 min., making a total of 13 min.

L.B.S.C.'s "NETTA"

(*Continued from page* 595)

3/32 in. at each side, the diameter of pipes being $\frac{1}{8}$-in. and 5/32 in. respectively. Drill a hole in the middle of each, the same diameter as bore of pipe, or file halfway through the pipe with a rat-tail file.

The smaller blastpipe needs a piece of copper tube 5/32 in. dia. and a bare 1 in. long ; the larger, $1\frac{1}{4}$ in. of $\frac{3}{16}$ in. tube. One end has a few threads put on it, for the nozzle ; the other end is slotted down with a round file, as shown. The cross-pipe is placed in the slot, with the hole in it registering with the bore of the blastpipe ; the " horns " are bent over to hold it in place, and the joint silver-soldered, the final appearance being as shown in the perspective sketch.

To erect, slack off one cylinder, and insert the cross pipe through the openings, from the top ; enter the end in the hole in the flange of the other cylinder, and replace the slacked cylinder with the other end of the cross pipe entering the corresponding hole in the flange. When the blastpipe is set centrally between the frames, there should be an equal amount in each cylinder ; and, when the boiler is on, the cross pipe cannot come out of either, as it cannot move sideways when the blastpipe is through the hole in the bottom of the smokebox. The pipe is bent as shown, to bring it vertical, as the centre of chimney doesn't correspond with the centre of cylinders. The nozzles are made just like union nuts, except that they are chamfered a little more, and the holes are drilled to the sizes indicated on the drawing. The above should give the builders of the little quins plenty of work while I deal with the reversing levers and other oddments for the larger members of the family.

Miniature Steam Turbo-Generators

By E. Rowbottom
(South Africa)

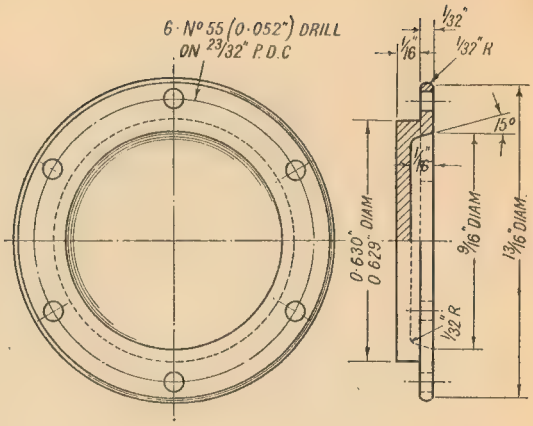


Fig. 10. Cover of turbine casing (brass)

THE steam nozzle is required next: it is of brass (see Fig. 9). It is machined for the turbine wheel clearance while mounted in its tube, into which it should be a good fit. To shape the tapered nozzle, make a half round reamer, from a piece of 3/32 in. diameter silver-steel. Grind or file a point on the end, 1 11/32 in. long, cut about ½ in. off this point to make it less dangerous, file half the diameter away and polish the flat surface. Make a scratch mark across the flat where it measures 0.0516 in.—this is to indicate how far to feed the reamer into the job; harden and temper as usual and again polish the flat surface, which will show up the scratch more clearly. To machine the turbine wheel clearance, press the nozzle into its tube and mount the whole assembly in the four-jaw chuck to run true and, with a keen-edged boring tool, taking light cuts, machine the nozzle tip to the same size as the access hole through the turbine casing. Make the exhaust extension tube, and the case cover, which is shown in Fig. 10.

The front portion of the generator casing is shown in Fig. 11: it is of brass, and is fitted with the insulated terminal post, as shown on the same drawing, and a 5 B.A. hexagon headed oiling plug. The same remarks apply to this casing as was said for the rear case in regard to bearing and stator core fits. This completes the job, except for the assembly.

The ball-bearings used are $\frac{5}{16}$ in. outside diameter, ⅛ in. bore and 7/64 in. wide; they have plastic cages—for high speed—that retain a certain amount of oil.

[These bearings are obtainable from: Messrs. B.M.B. (Sales) Ltd., 2 Balfour Place, Mount Street, London, W.1. They are designated: Ref. No. RC⅛—Grade 5—High precision—with plastic cage for high speed—2 dot fit.]

The assembly is simple enough. The drawing, Fig. 12, will show how the parts go together. Be careful how you handle the tiny ball-bearings, see that no dust or foreign matter gets into them.

When the halves of the generator casing are firmly bolted together, there should be just the smallest amount of end movement to the rotating element. A drop of oil, now and again, on to the felt washer, and into the front oiling hole, and an occasional clean up of the steam nozzle by its immersion into vinegar for a short while is all the attention your little machine will require.

Run the machine, slowly at first, for about an hour to enable the bearings to settle down, then you can "let her rip"—mind out for burnt out lamps!

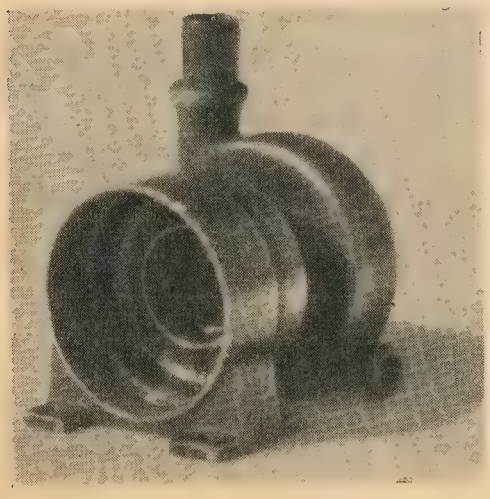
Governing

Although the turbine can be run directly from boiler steam, it is desirable to have some means of governing the speed within reasonable limits. Especially is this the case when the machine is to be mounted on a locomotive, as, under this condition, without control of some kind, the boiler pressure variations directly influence the turbine speed, with consequent results in generator output.

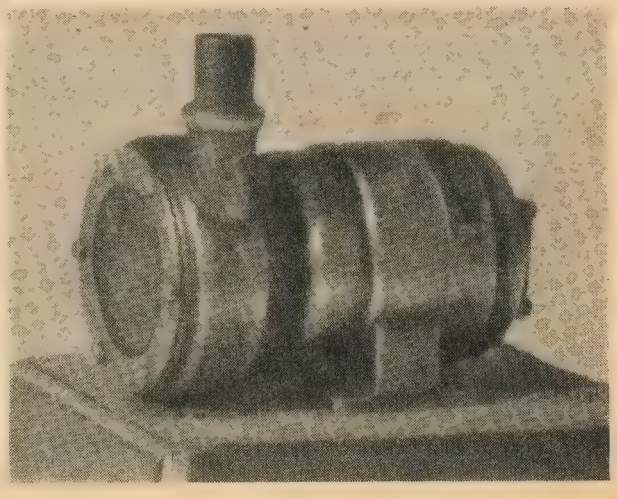
As auxiliary equipment, a "control valve" is fitted with all my turbo-generators—even the crude first machine had one, and such a valve is shown in Fig. 13.

In operation, it is just a simple pressure reducing-valve. The turbines anyway require 30-40 lb. of steam

Continued from page 578, November 11, 1954.



Rear generator casing and turbine casing assembly



The assembled machine

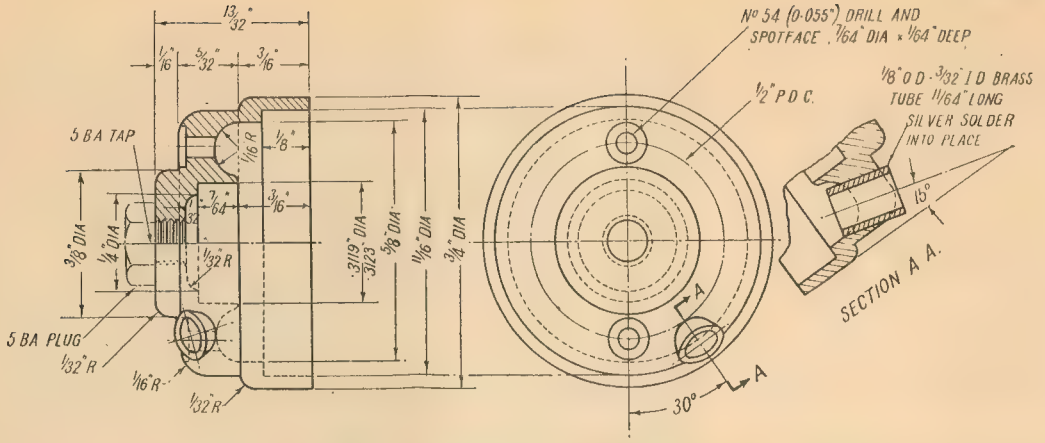
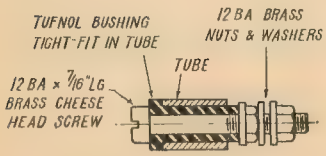


Fig. 11. Generator casing—front (brass)



DETAIL OF TERMINAL

pressure, whereas the average small locomotive works at 75-90 lb. pressure.

The drawing should be quite clear. There is only one point to watch : see that the balanced steam admission-valve is steam tight when the adjusting-screw is released. It is desirable to fit an isolation boiler stop-valve, but always start and stop the turbine with the " control valve " itself.

Connections for a " drain "—to which a plug cock or screw down valve could be fitted—and a pressure gauge are shown, as it is nice to be able to get rid of condensate at starting and to be able to " see " how things are going while running.

Stator core with winding, and front generator casing

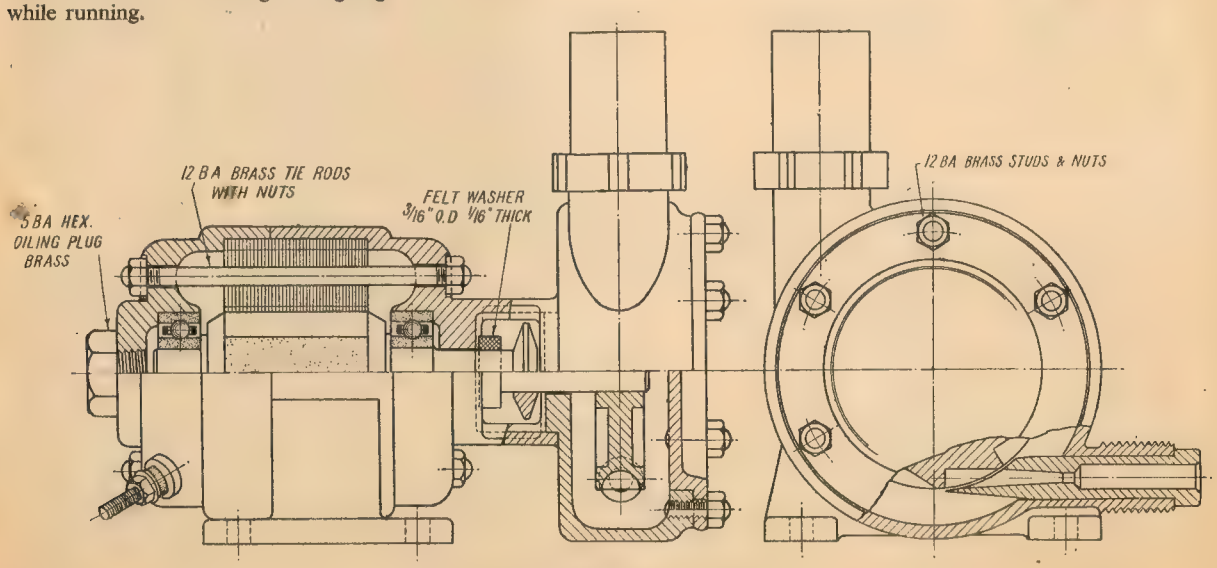
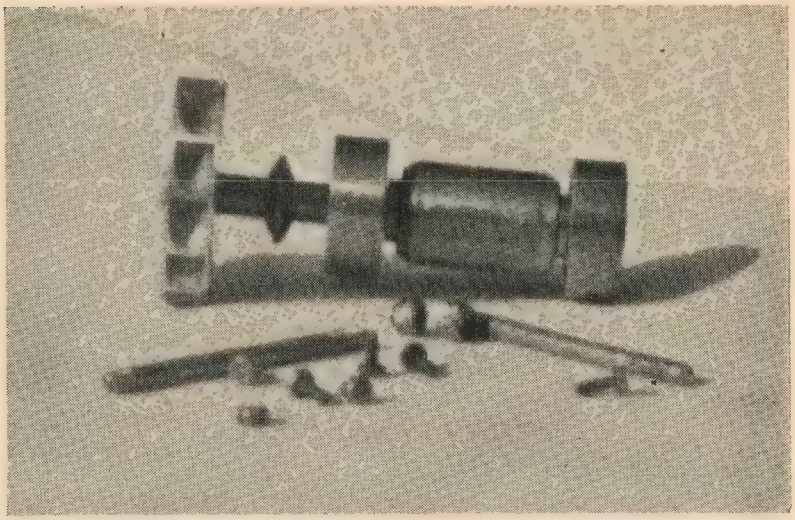


Fig. 12: Steam turbo-generator assembly

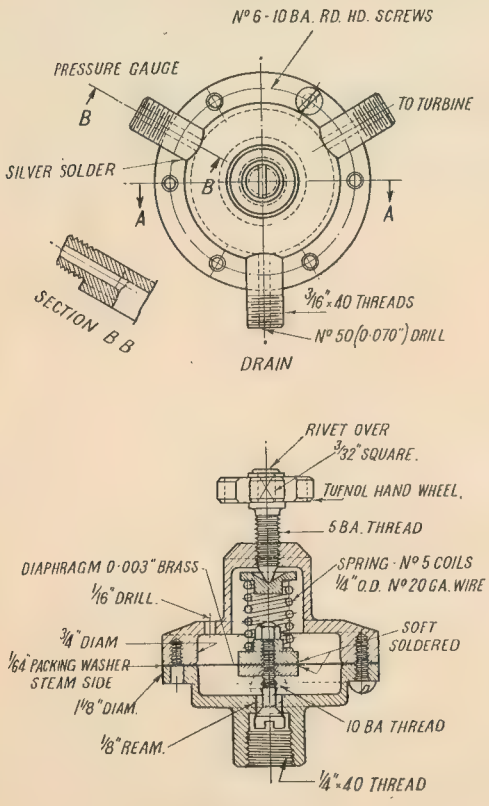
Steam pipes of $\frac{1}{8}$ in. diameter will supply all the steam required for normal load. You may find it necessary, when starting up, to "flick" the deflector with a match stick to "get her away." This will be due to the "pull" of the magnet.

Turbo-generators are usually mounted high up on the boiler barrel of locomotives, but the modern tendency, on the South African Railways anyway, has been to fix them on the running-board about six feet in front of the cab, and to fit an extension exhaust pipe which terminates in the ashpan. Personally, I favour this latter method for the miniature machines, as the extended exhaust pipe quietens down the "hum" when running, and there is no spluttering of water, when starting up, to disfigure the turbine, as is the case with a short exhaust pipe. However, where the particular engine being built demands that the turbo-generator be mounted on the boiler barrel, the steam nozzle should be re-located about 30 deg., in either direction, from that which is shown on the drawings, to allow the machine to be fixed sufficiently near the barrel without interfering with the steam pipe union nut and loading gauge limits.

Whichever method is adopted, see that there is a good "earth" connection, and soft-solder a little brass "lug," made from 0.005 in. shim stock, to the end of the "live" wire for connecting to the terminal.



Rotating element with 30 mm. diameter ball-bearings. (Before the advent of the $\frac{5}{16}$-in. bearings as used now)



Section A.A.

Fig. 13. Turbo-generator control-valve (brass)

For "wiring up" use No. 30 gauge plastic covered copper wire, the variety as used in radio work, and which is about $\frac{1}{16}$ in. diameter over the covering.

For "conduit," use $\frac{1}{8}$ in. diameter, thin-walled brass or copper tube, and if you are particular, make little tee-pieces, the inspection variety, and elbows as required.

A "wonder lead" plug connection is useful for "trouble on the road," and a resistance with cut-out switch, connected in the head lamp circuit, will enable you to dim the light upon approaching the station, instead of blinding everyone waiting for the train.

Mr. A. E. F. Spence of Capetown helped considerably with the early electrical experiments, and recently, a Mr. E. Mitchley conducted the oscillograph frequency speed tests. It was interesting to note, during these tests, that the generator frequency line, as projected on to the screen of the instrument, began to break up into a wave at about 12,000 r.p.m. and that 3 volts was generated at 54,000 r.p.m. with no load and at 25 lb. steam pressure. As the load was increased the speed dropped and had to be brought back by increasing the pressure until, with four lamps in circuit, the desired speed was maintained with 45 lb. pressure. Normally, the load is three lamps, and this requires a pressure of 40 lb. to maintain the 54,000 r.p.m.

I might add that the "control valve" is useful, not only as a medium of control under normal running conditions, but more so when tests, requiring rapid changes of pressure, are being carried out.

Paint or otherwise finish the machine to your own fancy and she will look as realistic as she sounds when running.

Photographs Figs. 1 and 2 were taken by Egon Fischel: Fig. 2a by the author, and the others by E. Mitchley.

SMALL GEAR WHEELS

Messrs. S. H. Muffett Ltd., Mount Ephraim Works, Tunbridge Wells, have sent us their revised gear list, which includes a wide range of spur, bevel, worm and spiral gears in steel, cast-iron, brass and light alloys. The spur gears range from 12 to 120 teeth, in various pitches from 24 to 100 d.p., embracing sizes from 0.22 in. to 3.417 in. outside diameter. Bevel gears are available in ratios from 1 : 1 to 4 : 1, 16, 32 and 64 d.p., and racks in brass or steel, 24 and 32 d.p., also ratchet wheels, ground shafting and collars, and complete worm reduction gearboxes in various sizes and ratios. All items are machined to close limits of precision, and gears are machined from solid.

SEATING CHEESE-HEAD SCREWS

By "Duplex"

IN instrument work, and in the construction of machine tools, countersunk-head screws are seldom used except for securing sheet-metal fittings. The reason for this is, perhaps, that screws of this form can hardly be relied on to give accurate location of one part on another, for in some commercial screws, the head is not always concentric with the shank, and the countersink formed in the work may run out during machining.

Readers will, no doubt, have come across instances where, in order to secure correct location, the screws have to be tightened in a definite order to prevent a faulty screw or a misplaced countersunk taking charge and upsetting the correct mating of the parts. Cheese-head screws, on the other hand, afford location from the plain portion of the shank and, as the head is given a small clearance, there should be no displacement when the screw is fully tightened.

With a correctly fitted screw of this kind, the underside of the head bears on a flat, machined surface, and not on the coned surface left after drilling the recess for the screw-head.

Commercial, Whitworth thread, cheese-head screws are usually made with the diameter of the head equal to one and a half times the diameter of the shank, and for B.A. screws this dimension may be increased to one and three-quarter times the shank diameter.

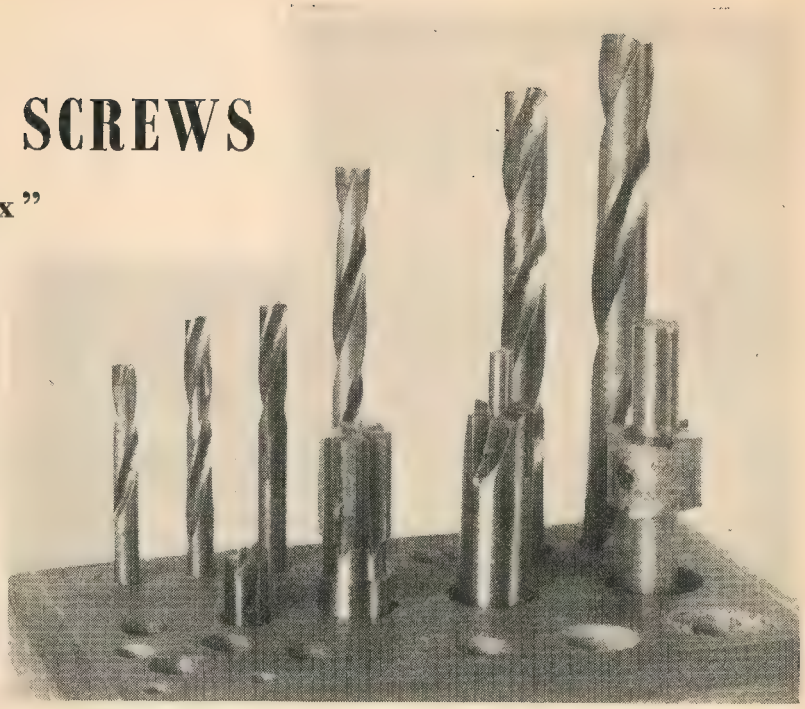


Fig. 1. Various types of cutters used for machining screw-head seatings

The two dimensions required when machining the recess are the diameter and depth, and the correct diameter can be obtained by using either a spot-face cutter or a twist drill.

Where a spot-face cutter is used, a preliminary hole is drilled in the work to fit the pilot, and the recess is then machined to the required depth; finally, the pilot hole is drilled out to fit the shank of the screw. A method more commonly used is first to drill the work to fit the screw shank and then to drill the head recess just short of the finished depth with a second drill. To remove the conical surface left by the twist drill and so afford the screw head a flat seating, any of the four types of cutters illustrated in Fig. 1 can be used; that is to say, either a spot-face cutter, an end-mill, or a twist drill with the end face ground flat. After the length of the screw head has been measured, the cutter, mounted in the drilling machine, is brought into contact with the work surface and the depthing gauge of the machine is set to zero. Before starting the machine, the cutter is entered in the drilled hole and the recess is then machined to the finished depth. If the drilling stop is

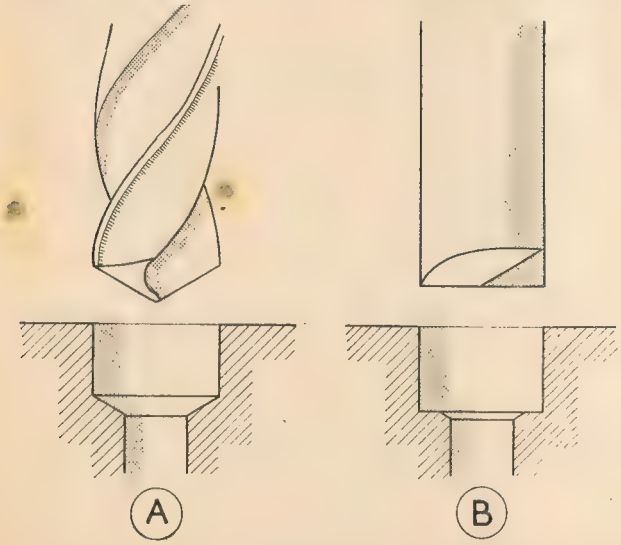


Fig. 2. Showing the two stages in forming a recess for the screw head

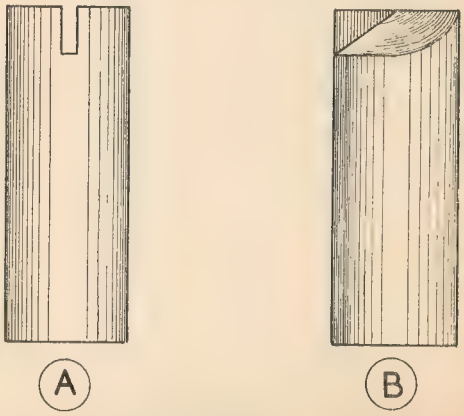


Fig. 3. Showing the method of making a facing cutter

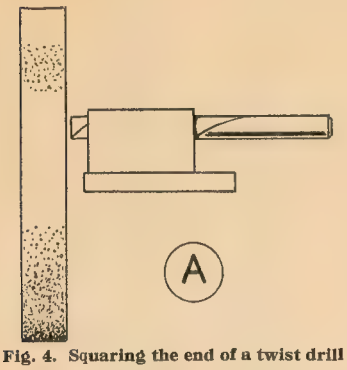


Fig. 4. Squaring the end of a twist drill

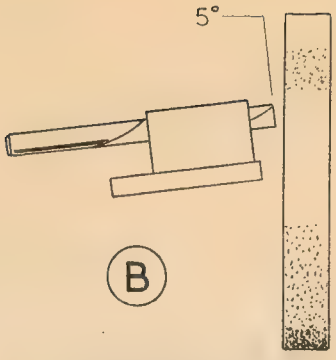


Fig. 5. Grinding the two cutting edges on the end of the drill

now set, the remaining recesses can all be machined to the same depth.

The two machining operations are illustrated in Fig. 2, and it will be noticed that the conical surface left by the twist drill has not been entirely eliminated; this is done purposely in order to allow for any lack of flatness that may be present at the junction of the shank with the head of the screw.

Machining the seatings for standard Whitworth screws presents no difficulty, as the recess for the head is a fractional-inch size and standard end-mills can be used, but with commercial B.A. screws, this is not so, and odd-size cutters may be needed, for the head diameters of 6 B.A., 4 B.A. and 2 B.A. screws are 0.193 in., 0.248 in. and 0.324 in. respectively. However, it is always possible to chuck the screws to run truly, and then reduce the head diameter to a fractional-inch size.

As a rule, when doing well-finished work, we make the screws specially for the job, so that 4 B.A. screws are machined from $\frac{1}{4}$ in. diameter material and the 2 B.A. size are turned from $\frac{5}{16}$ in. diameter rod.

Cutters for carrying out the second operation shown in Fig. 2 are easily made in the workshop to any required diameter. A short length of silver-steel rod is gripped in the chuck and the end is faced and, if necessary, reduced to the required diameter. Next, as represented in Fig. 3 *A*, a cut is made diametrically across the end with a hacksaw. To form the cutting lips, the end of the tool is filed on either side in the way shown in Fig. 3 *B*, but the filing should stop just short of the actual cutting edge. After the cutter has been hardened, and then tempered to a straw colour, the narrow lands left by filing the lips are stoned at an angle with an abrasive slip, so as to produce sharp, flat cutting edges, having sufficient back-off to give cutting clearance.

If broken or worn twist drills happen to be available, useful cutters can readily be made by grinding the ends to shape.

As shown in Fig. 4, the end of the drill is first ground flat, and square across, by clamping it in a V-block and setting the grinding rest at right-angles to the side face of the wheel, but during the grinding operation care must be taken not to overheat the drill and draw its temper. To back off the cutting edges and give cutting clearance, the grinding rest is tilted to an angle of some 5 deg. as represented in Fig. 5.

One lip is then ground, but only as far as the centre of the drill and, at the same time, the ground surface should do no more than just meet the flat edge already ground across the drill.

The drill is now turned through an angle of 180 deg. and clamped in the V-block with the cutting edge again lying horizontal.

After both edges have been ground in this way, they should be found to form a straight line across the end of the drill, for the two lips will then take an equal share in cutting.

When making a batch of screws for a particular piece of work, we sometimes first form all the recesses for the screw heads to an equal depth. The head of one screw is then machined to the exact finished length and, after locking the lathe saddle, the remaining screw heads are faced to length at this setting.

Whatever method of fitting is adopted, the screws when fully tightened should lie with their heads exactly flush with the work surface.

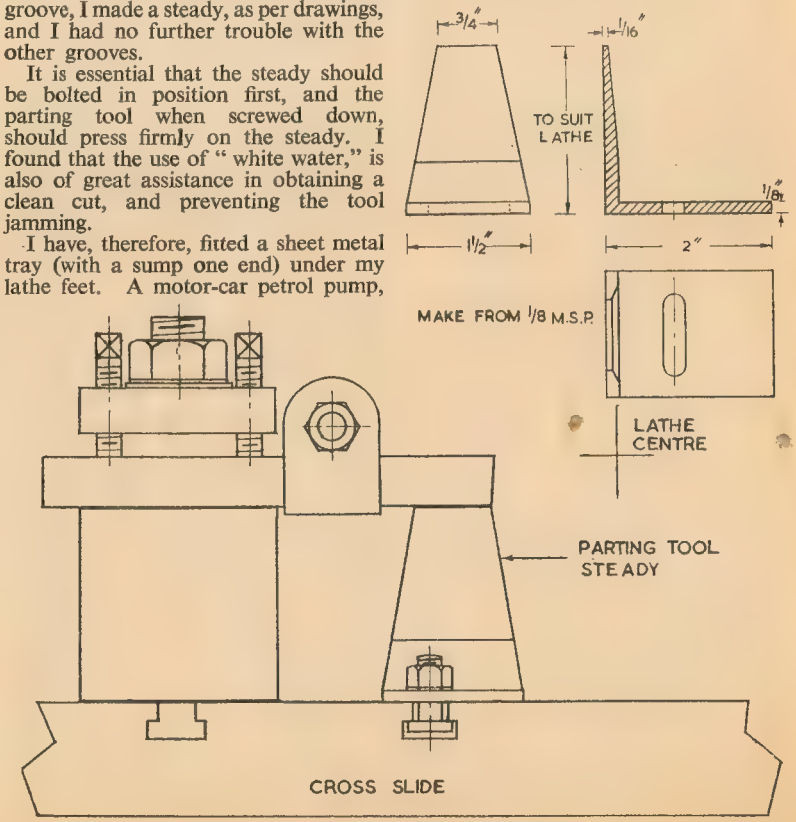
A PARTING TOOL STEADY

PARTING off is always regarded, by professional as well as amateur turners with a certain amount of awe.

Recently I had to cut 30 grooves 3/32 in. wide, 1 in. deep, in 3½-in. steel on my lathe in my home workshop. After numerous dig-ins with the first groove, I made a steady, as per drawings, and I had no further trouble with the other grooves.

It is essential that the steady should be bolted in position first, and the parting tool when screwed down, should press firmly on the steady. I found that the use of " white water," is also of great assistance in obtaining a clean cut, and preventing the tool jamming.

I have, therefore, fitted a sheet metal tray (with a sump one end) under my lathe feet. A motor-car petrol pump, of the type which is usually driven by an eccentric on the camshaft, was fitted up, and driven by an eccentric on the countershaft. This works very satisfactorily and supplies plenty of " white water."—C. H. TOOGOOD.



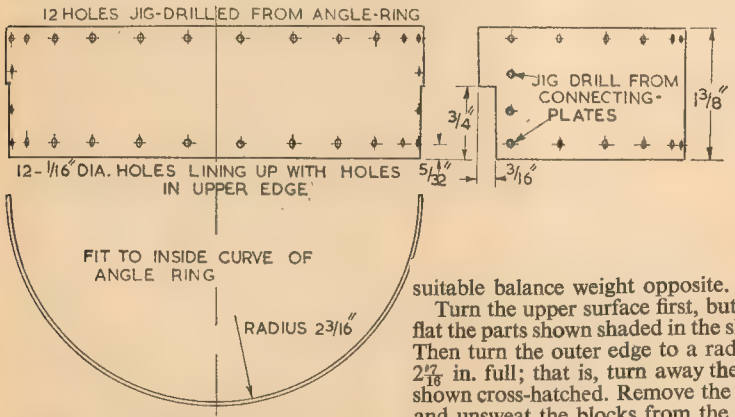
THE ALLCHIN "M.E." TRACTION ENGINE

to 1½ in. Scale

By W. J. Hughes

A FEW more bits and pieces are required before we are ready for assembling the front axle and spud-pan, but, first, while you have the bottom of the pan in hand, you can set out and file the small notches in its edge. They are 3/32 in. deep, and should be a good fit, on the thickness of the axle.

For the front and back of the pan, you will need two strips of brass, or bright mild-steel, 1⅜ in. wide and of


12 HOLES JIG-DRILLED FROM ANGLE-RING
JIG DRILL FROM CONNECTING-PLATES
1 3/16"
3/4"
12 - 1/16" DIA. HOLES LINING UP WITH HOLES IN UPPER EDGE
5/32"
3/16"
FIT TO INSIDE CURVE OF ANGLE RING
RADIUS 2 3/16"

Front and back plates of spud pan

18-gauge thickness. Their length can be obtained by measuring half the circumference of the pan bottom, either with a thin flexible rule or a strip of thin card, but allow a little fullness on this measurement to give a margin for final fitting. Similarly, when filing out the notches at the sides to clear the axle, allow a little fullness.

The four connecting-plates may now be set out and filed to shape, from 16-gauge material, but here again do not file quite to the lines, to allow for individual fitting in final assembly.

I was fortunate so far as the check-angles were concerned, for J. S. Christopher sent me a couple which only needed finishing. He had obtained a large brass bush from a local scrap-yard, and had turned from it an angle-ring of correct profile and diameter, from which he had cut two segments for his check-angles. The surplus he sent to me, so that from it I was able to cut and file up a pair (saving me valuable time for which I was duly grateful, of course).

Any other builder could make his in the same way, or they could be turned from the solid bar. In this case, two pieces of brass 2⅜ in. long by ¾ in. by ⅜ in. would be required. They should be sweated to a piece of 16-gauge brass sheet (as indicated in the sketch), which is then secured to the faceplate, with a suitable balance weight opposite.

Turn the upper surface first, but leave flat the parts shown shaded in the sketch. Then turn the outer edge to a radius of 2 7/16 in. full; that is, turn away the parts shown cross-hatched. Remove the work, and unsweat the blocks from the sheet.

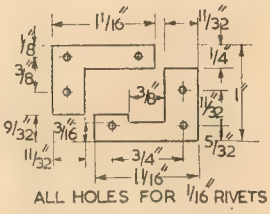
Secure the latter to the faceplate again, and scribe a line on it at 2 7/16 in. full radius. Tin the "shaded" parts of the blocks, and sweat them to the sheet with their outer edges to the scribed line. The underside of the angles may then be turned, and they can be parted off by turning away the inner radius.

However, I think that it would be far easier to form the angles from commercial 5/16 in. by 1/16-in. brass angle. It will be necessary to bend one of the webs upwards slightly, to correspond to the drawing, and then to make the curve over a suitable former—a piece of tube or even a largish glass bottle. It will be easier to bend the angle if you have a longer piece than really necessary, of course.

When the angle is bent, the outer edge of the upper web should be filed thinner, as drawn, and then the two pieces may be cut off and finished.

The brackets for the steerage chains are cut from ⅜-in. by ¼-in. mild-steel bar. If a piece of this, 2¼ in. long, is clamped to the faceplate, the internal radius may be turned out to fit the spud-pan angle ring.

Remove the work from the faceplate, and cut it in two. Set out and file to shape, and drill the two outside holes



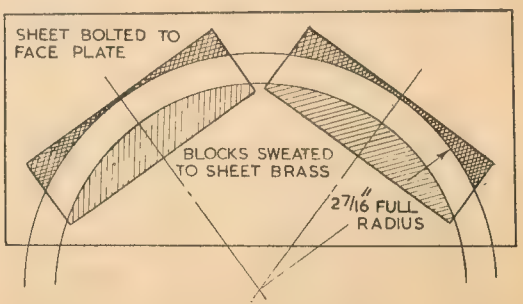
Connecting-plates of pan

No. 39, leaving the other until later Finish by draw-filing.

The distance-blocks may be made from ½-in. by 5/16-in. or ¼-in. by 5/16-in. bar, in brass or mild-steel. If ½-in. bar is used, take a length of about ⅝ in., and end-mill or otherwise form the ⅜-in. groove, 1/16 in. deep on the underside. Cut in two, and either mill or file the pieces to ¼ in long each. Drill a No. 39 hole in the centre of each piece.

To make the securing bolts, grip a piece of 3/16 in. diameter mild-steel rod in the three-jaw chuck, and turn down to 3/32 in. diameter for a length of 1 in., and ⅛ in. diameter for a further 1/16 in.

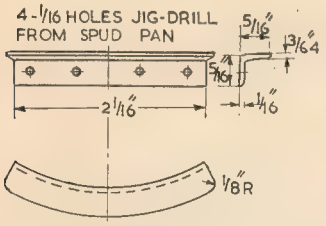
Take a fine safe-edged file, and file the ⅛-in. collar down to a 3/32-in.



Sketch to show how check-angles may be turned

Continued from page 365, *September* 23, 1954.

square section; this will leave the corners slightly rounded, but that doesn't matter. If you have a filing-rest, so much the better; if not, start with No. 1 jaw vertical and file one side. Turn the chuck to bring No. 1 jaw horizontal, file the next side, and so on.



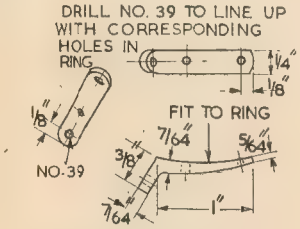
Check-angles for chain

With the 7-B.A. die in the tailstock holder, screw the end of the work for a length of $\frac{1}{4}$ in., and then part off to $1\frac{1}{8}$ in. long. Reverse in the chuck, take a skim off the head, and round it off neatly.

We are now ready to commence assembling the spud-pan, and the first step will be to set out the holes in the angle-ring. With dividers or oddlegs, scribe a line $\frac{1}{8}$ in. from the top edge. Carefully mark the diametral centre-line on the under-side of the ring—a centre-square is useful here—and drill the two No. 39 holes at 5/32 in. from the edges (see drawing in last instalment). File these out with a square needle file to fit the heads of the securing bolts.

On the line $\frac{1}{8}$ in. from the top edge, mark out the centres of the four holes which are shown $\frac{3}{8}$ in. distant from the centre-line, two at the front and two at the back of it. Centre-pop these. Set out with the dividers *eleven* equal spaces between these holes on the front, and eleven on the back, which, of course, will give *twelve* holes front and back.

On the inside faces of the brackets for the steerage chains, mark the same distance with the dividers, measuring from the centre of the end hole, and drill the second No. 39 hole in this face.



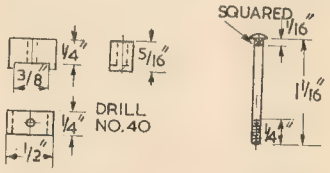
Brackets for steerage chains

Taking up the angle-ring again, drill all twelve holes on the back face $\frac{1}{16}$ in. diameter, and on the front face the eight holes marked *A*. Countersink all these holes outside for the rivets. Of the four holes marked *B*, which are for the attachment of the chain-brackets, drill only one at each side, with a No. 39 drill; bolt the brackets in place with 7-B.A. screws, and jig-drill the others through those in the brackets, which can then be removed.

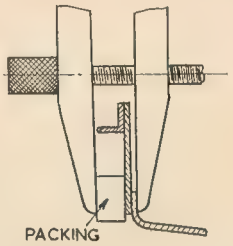
Now secure the front of the pan to the angle-ring with two or three toolmakers' clamps. See that the top edges come flush, and that the front is properly centralised. Drill through one of the *A* holes at the very front, insert a $\frac{1}{16}$-in. rivet from the inside, and rivet it over on the outside into the countersink.

You say you can't hammer it because the web of the angle-ring is in the way? Simple—use a flat-ended punch (like a nail-punch) to head the rivet. On the inside, of course, the rivet-head is supported in a dolly.

Drill through the second *A* hole at the front, and put in a second rivet. Change the drill to No. 39, drill the two *B* holes through at each side, and put in 7-B.A. screws, with nuts and washers



Distance-blocks and securing-bolts



How to clamp bottom in place

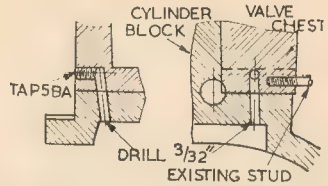
on the inside. Then, one at a time, drill the other *A* holes and insert the rivets, except for the two outer ones at each side, where the check angles are to be riveted. Small screws and nuts—11 or 12 B.A.—may be inserted here temporarily.

Now try the back of the pan in place, filing the small surplus off the ends as necessary. Clamp it to the ring, and open out the slot at each side, between front and back, until the axle fits tightly in place. Note that the bottom of the pan should also fit correctly, with its notches over the axle, at this stage.

When all fit properly, remove bottom and axle, and rivet the back to the ring. Set dividers or oddlegs to 5/32 in., and scribe the lines for the bottom row of rivets on front and back. On these lines set out the centres in line with the upper rivets, and drill all except the four holes next to and each side of the axle slots.

Fit the axle and distance-pieces, slip the bolts through, and secure with nuts and washers.

Now for riveting the bottom of the pan in place, you will need an offset riveting dolly like the one that was made when we were fixing the hind-wheel spokes. In fact, the same arm will probably serve now—mine did—but a new snap will be needed to suit the $\frac{1}{16}$ in. rivets.



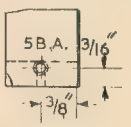
Correction: How to drill for blower pipe

Put the spud-pan bottom in position—see that it is straight, of course—and clamp to the front and back. Small G-cramps are useful here, but toolmakers' clamps will do with a bit of packing as sketched.

The holes may now be drilled, and rivets inserted, one at a time, these rivets being snap-headed outside as well as in.

Next job is to fit the connecting-plates, as shown in the spud-pan general arrangement drawing last time. Take good care to make them a good fit, with no gaps showing round the axle or between the plates themselves. This done, set out and drill the holes in them; clamp in place one at a time, drill through, and rivet them. You may possibly have to grind a bit off the side of the dolly for this, because the working-space is very confined here. However, it can be done without much trouble.

Finally, clamp, drill, and rivet the check-angles to the pan. File off the countersunk rivets flush with the surface of the angle-ring, and bolt the brackets for the steerage-chain in position, with 7-B.A. hexagon-headed screws and nuts. This concludes the work on the spud-pan.

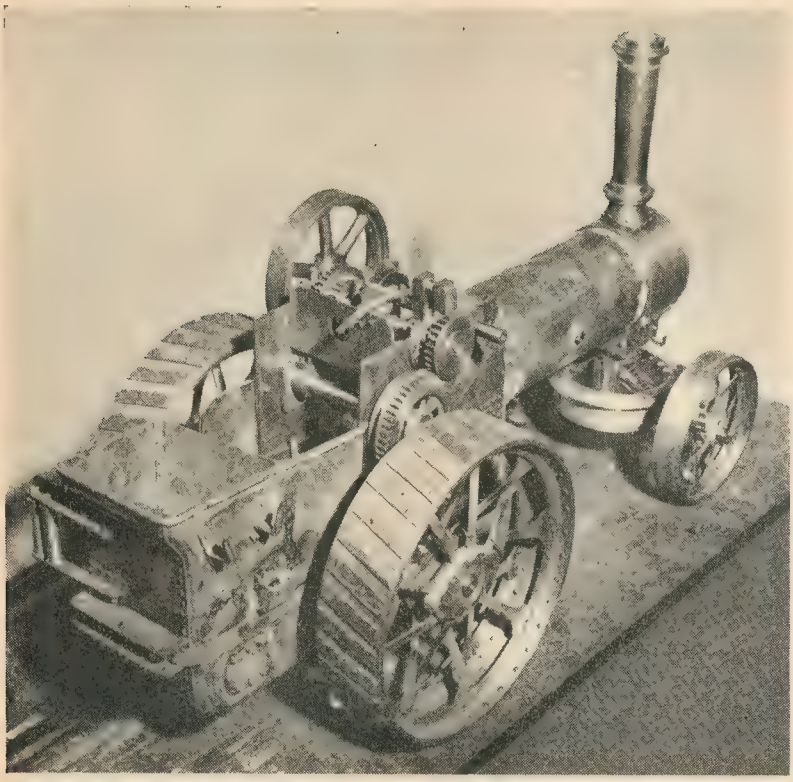


Setting-out for blower connection

I am indebted to J. S. Christopher for drawing my attention to a silly error in Sheet 6 of the blueprints, concerning the orifice for the blower-valve. As drawn, this can only take steam when the regulator is open, which obviously is wrong.

The sketch now given shows how to overcome this; the hole into which the pipe screws is drilled and tapped from the front of the valve-chest as before, and a connecting-passage drilled up to meet it, at a slight angle, from the steam-space in the cylinder-saddle.

Those who have drilled the hole



Photograph No. 75. This excellent Allchin, being built by D. W. Massie of Montreal, is probably the most advanced of all

already should plug the hole on the outside with a screw-plug, sweated in and filed flush, and set out the position as now drawn, for a new opening. Note that the tapping-size is now given as 5-B.A. instead of 5/32 in. by 40, by the way; this is nearer scale size for the pipe, and will still pass plenty of steam for the blower.

A Canadian Allchin

The model Allchin which is more advanced than any other—at least, to my knowledge—is that which is being built by Douglas Massie of Montreal, Canada, whose locomotives have often been mentioned by "L.B.S.C." in the past.

Mr. Massie, of course, is a very experienced model engineer, and so has been able to go far beyond the published instructions and detail drawings. Working from the general arrangement drawing, and from his own knowledge, he has evolved his own boiler design. The front wheels are complete, too, and the engine thus looks well on the way to being finished.

The accompanying excellent photograph was taken by A. W. (Bill) Leggett, a fellow conspirator of Mr. Massie, and shows the engine at the "semi-erected" stage. At the time of writing, work on the cylinder and motion is proceeding well, and certainly it looks as if this will be the first Allchin to be finished, my own included!

(To be continued)

AN INTERESTING BOILER REPAIR

By E. V. M. Powell, M.I.Loco.E.

THE preparation of the club engine, a 5-in. gauge *Ajax*, commenced with the hydraulic test of the boiler. A pressure of 60 lb. per sq. in. had been reached, when a voice spoke up: "What's happening at the front end?" Opening the smoke-box door revealed the smoke-box full of water. The pressure was already released, so the smokebox was

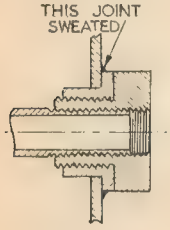


Fig. 1

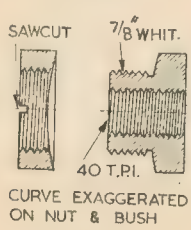


Fig. 2

dismantled, and it was obvious that the water was coming from the main steam-pipe joint in the front tubeplate. Further examination revealed that the internally and externally screwed bush was screwed, not direct into the tube-plate, but into a flanged bush which was only sweated into the tubeplate (see Fig. 1).

Although it had stood up without trouble to a season and a half's running, a total of approx. 110 hours in steam, after six months idle, the sweating gave out on hydraulic test under only 60 lb. pressure. The problem then was how the repair was to be effected. The hole in the tubeplate was $\frac{5}{8}$ in. diameter and no fine-thread taps that size were available; so, as the first of the year's engagements was fast approaching, the following procedure was adopted.

First, a trepanning tool was made and the hole in the tubeplate was enlarged to $\frac{7}{8}$ in. diameter. Then a flanged bush was made, screwed $\frac{7}{8}$ in. Whit. outside and 40 t.p.i. inside to fit the steampipe, and a circular nut screwed inside $\frac{7}{8}$ in. Whit. (see Fig. 2).

Holes were drilled in the flange of the flanged bush for use with a "C" spanner. A length of copper wire was soldered to the round nut, which also had a saw-cut across the back. The copper wire and nut were inserted through the dome and the nut drawn up to the front tubeplate. A piece of thin brass just long enough to fit the saw-cut in the back of the nut was then inserted between a folded piece of thin copper sheet, as shown in Fig. 3 in plan. When this had been passed through the nut it was pulled forward carefully until the piece of brass fitted into the saw-cut and the nut could be held tight against the tubeplate (see Fig. 4).

The screwed bush was then passed over the copper strip, taking care always to keep the round nut tight on the tubeplate, and was screwed into the nut. It was tightened with a "C" spanner, final tightening being by hammer and punch. The copper strip holding the nut up to the tubeplate was withdrawn by pulling one end, and the small brass bridge-piece abandoned inside the boiler.

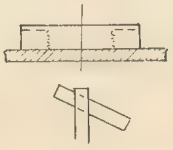


Fig. 3

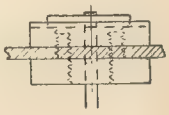


Fig. 4

The regulator and steampipe were replaced and the front end restored. As the flange of the new screwed bush was thicker than that of the removed sweated one, a piece had to be taken out of the petticoat pipe to clear the superheater. The repair stood up to 120 lb. hydraulic test; the engine has been in steam four times since and the joint has given no trouble.

READERS' LETTERS

Letters of general interest on all subjects relating to model engineering are welcomed. A nom-de-plume may be used, but the name and address of the sender must accompany the letter. The Managing Editor does not accept responsibility for the views expressed by correspondents.

THE DORSET BURRELL

DEAR SIR,—I have read with interest the letter of Mr. H. E. Rendall of Swanage about the Burrell in Dorset. This road locomotive once belonged to Messrs. Herbert of Dorchester, who are showmen, and they sold it to Mr. Hurst of the Griffin Foundry, Birmingham, for preservation. There were three engines standing in this yard at the same time, the other two being a Burrell tractor, *St. Bernard* and a Fowler traction engine. The *St. Bernard* has also been purchased by a local man for preservation, but the Fowler has seen better days and now stands in her grave.

The *Majestic* was retubed and given a general overhaul before she left Dorchester under her own steam, which would account for her being well greased and licensed for this year.

I have photographs of all three engines which were taken during her last days in Dorchester, and if anyone wishing to exchange photographs will contact me, I will be only too pleased to oblige.

Yours faithfully,

Dorchester. E. G. WHITE.

A SHIPWRIGHT'S MODEL

DEAR SIR,—I have been given some back numbers of THE MODEL ENGINEER, and I was interested in the cover picture of the July 1st issue, as it shows a like model to that which I am just completing, the Vosper M.T.B., by W. J. Hughes.

I thought you might be interested in the accompanying photograph, taken of my model on its trial trip.

I have made alterations and various additions to the plans.

When I started building, I intended using a diesel engine, and so widened the after end of the bridge, this being portable, to give easier access to engine for starting. Later, I installed electric power. Also, the hatch on the after end of the upper deck, has been enlarged, for easy access to rudder control.

The additions include "whip" wireless aerials each side of bridge, and additional radar aerials on mast; also, small turned crowns on ensign and jack staffs, crests and number on lifebelt. Dotted around the deck are salt-water fire connections, and one fresh-water filling valve.

This, by the way, is my first attempt, but most certainly not my last.

Items still to be fitted include the anchor, boat hooks, signal halyards and flags, and on the bridge, engine room telegraphs, and torpedo firing levers.

Yours faithfully,

H.M.S. "Lochinvar." JOHN FINCH.

AN EARLY AVELING ENGINE

DEAR SIR,—Some little time ago a statement appeared in THE MODEL ENGINEER that an Aveling & Porter traction engine No. 89 was still existing in working order at Bishop Wilton, E. Yorkshire. When I read this I thought it strange that a vintage chain-driven traction should have existed until now without discovery, and with even my limited knowledge of the subject I realised the date must be round about the mid 1860s—very early indeed. I could scarcely believe it!

However, I had the opportunity of inspecting the engine very recently and meeting its proud owner, Mr. M. C. Ripley, still very active, although two-and-ninety now he's rising. The name-plate has long since been lost, exposing in its recess the figures 89 cast in. This number is, of course, the part or pattern number of the valve chest cover, the correct works number of the engine being 2107 and the date *c.* 1900.

As it is very rare indeed that any error ever appears in THE MODEL ENGINEER, I feel sure you'll agree to this little correction. It shocked me that a pattern or part number could ever be taken for a works number, but I suppose even Homer sometimes nods!

Yours faithfully,

Norwich. RONALD H. CLARK.

RAIL TRACKS FOR MODEL CARS

DEAR SIR,—With reference to the patent applied for by Model Road Racing Cars Limited and the opposition to the grant of this which was lodged by the Model Car Association, we are happy to say that this matter has now been amicably settled. Representatives of the patentees having explained that they have no desire to hamper or obstruct the development of the sport of model road racing by amateurs, and the Model Car Association having only in mind the interest of amateur constructors and drivers, it has been possible to dispose of the matter.

The patentees have undertaken that:

(1) The guide fixtures for connecting the car to the guide rail will be available to members of affiliated clubs at a price of (approximately) 3s. each, which price in the opinion of the Model Car Association is a reasonable one for standard articles, and have moreover undertaken that the proceeds of such sales shall be applied to prize funds for the sport.

(2) That affiliated clubs shall be at liberty to construct rail tracks in accordance with the patented system, provided that the standard spacers are purchased from the patentees, ensuring the universal standard height of rail.

The association considers that the interest of the ordinary club member as an amateur practising this style of racing is adequately protected, and therefore, feels it proper to withdraw the objection to the granting of the patent, which has been done. The patentees have, as a gesture, contributed a sum towards the costs of the association in connection with this matter.

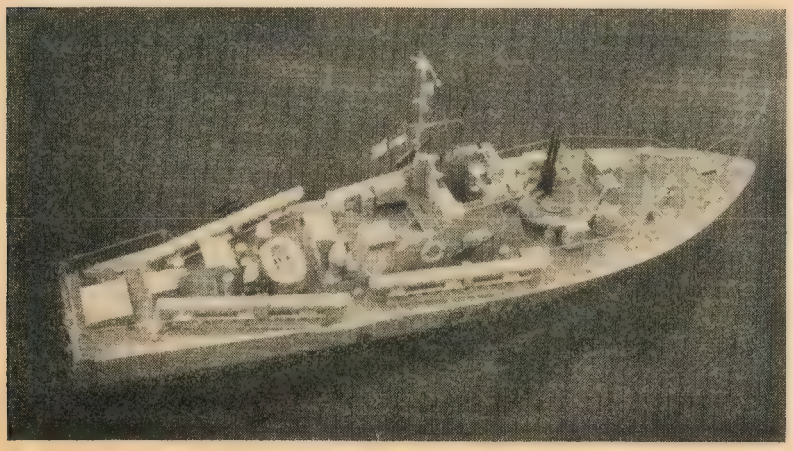
This outcome is felt by both parties to be satisfactory, particularly as it brings to an end a difference which might have had serious effects on the sport, and both parties wish to put on record the hope that with mutual and friendly co-operation they may be able to see the sport prosper in future.

Yours faithfully,

CLARKE, SQUARE & CO.

London. HUGHES & YOUNG,

(*Continued on page* 612)



A MINIATURE PADDLE STEAMER

By

The Rev. R. E. Davies

(W. Australia)

I TRUST that readers will be interested in these particulars of my miniature steamer, which had the honour of being inspected by their Royal Highnesses the Duke and Duchess of Gloucester in 1946. She has also been on the movies twice, one occasion being a ten minute newsreel for Siné Sound, by request from America. She has become known to a great many people, not only in Australia, but other countries as well.

These results have made me think that others might care to build a vessel on somewhat the same lines, as water is a cheap form of "track" where available, if launching facilities are possible.

The Prototype

In my childhood and early boyhood I was taken several times to Littlehampton, Sussex, for holidays, where I used to gleefully watch the harbour tug *Jumna* tow the three-masted sailing ships in or out of the harbour, gliding by with a fine display of foam from her powerful wheels. I last saw her about the year 1905, and I understand that she left Littlehampton in 1914, when I was out here in Australia. In 1936 I decided to build myself a boat for use on the Vasse River here in Busselton to be a practical job for the local conditions throughout the year, and being as keen on steam as ever, it occurred to me that I might as well build a steamer, preferably a reproduction in miniature of my old friend the *Jumna*. So that is what I did, launching her late in 1939 from which time she has served me faithfully.

In course of time I evolved improvements, both additions and simplifications, and I give you particulars as she now is.

Her hull is 12 ft. 6 in. long, and beam 3 ft., constructed of 22-gauge galvanised iron over a pine frame and floor. Joints are riveted about 2 in. apart, and thoroughly soldered to render water-tight. The bottom is flat, but rising 2 in. from centre to bow and stern. A 4 in. × 2 in. wooden keel runs down the centre, secured by brass studs, and also two short keels at the sides for enabling her to stand straight when on the truck.

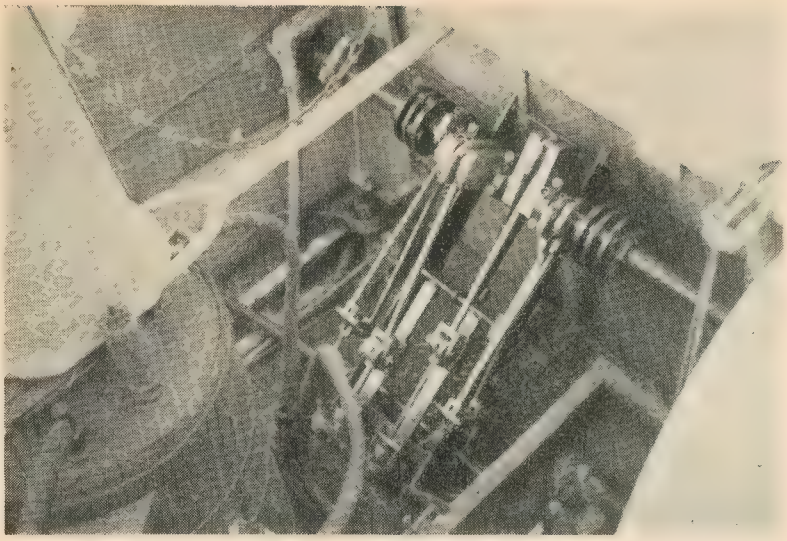
"Cruising down the river . . ."

Her paddles are of the feathering type, floats 13½ in. by 5½ in., the overall diameter of the wheels being 2 ft. The paddle shaft is steel tube 1¼ in. diameter, running in ball-races just inside the hull, the shafts joining the crankshaft through flexible couplings of the leather and metal disc type. The engine is of the diagonal type, two-cylinder simple, $1\frac{11}{16}$ in. bore and 4 in. stroke. Valve-gear is Stephenson link motion, actuating D-valves with 5/32 in. outside lap and 1/32-in. lead. Cylinders are cast in one, and are of iron, as are the pistons, rings and valves. The eccentrics have cast-iron pulleys and gunmetal straps. The guide bars are of spring steel, but all the motion work, etc., is of mild-steel, welded where necessary. The crankshaft is of high tensile steel, $1\frac{1}{16}$ in. diameter, shrunk and welded into mild-steel webs.

The boiler is of 10-gauge copper, 11½ in. diameter, 21 in. high above the ash pan. The firebox contains one water-tube 3 in. diameter 14-gauge copper fixed at a 1 in 7 gradient to promote circulation, and six thimble tubes 1 in. diameter $\frac{1}{16}$-in. gauge copper. The fire-grate is made of mild-steel bars $\frac{3}{4}$ in. × $\frac{7}{16}$ in. on edge. Under the passenger seat is a 12 gallon tank which contains rainwater for boiler feed. When running, a pump maintains the feed, driven by an eccentric on the paddle shaft.

The Fittings

These consist of pop safety-valve, regulator, displacement lubricator, cylinder drain-cocks, control, reversing lever, manhole, water gauge with striped vision, fire door, three-note chime whistle and stop cock, blower, injector with valves, bilge ejector, scum cock, two wash out plugs, pump water control, hand pump, engine room bell controlled from front, release gear for mast and funnel rigging for use when



Down in the engine room

lowering them when running under bridges, and also for boat covering when out of use.

The boat was designed to cruise at walking pace, and this she does well, with two adults in front and myself behind. In full gear, the cut-off is 75 per cent., the next nick is 62 per cent. and the third from the end 50 per cent., which is the cruising position. The blow-off pressure is 80 lb., and with reasonably decent coal I can maintain steam varying from 65 to 80 lb., frequently having to run with the firedoor open for a time to avoid blowing off.

Sweet Music!

The chime whistle was made from instructions in "L.B.S.C.'s" *Live Steam Book*, and is a great success. It is 1¼ in. diameter. I often wonder if our good friend "L.B.S.C." ever reviled the original *Jumna* when the drawback bridge at Ford Junction stopped all trains while she towed ships up to Arundel or back again! I would dearly like to ask him!

Finally, the advantages of the design are as follow: The engine is out of the way of the driver, yet within reach if necessary. The shaft is well above the water line, and needs no stuffing box, only leather pads to hold back splash. The feathering paddles do not pick up weed in the summer season, and will negotiate almost anything if necessary. The slow speed of the engine, 85 revs. per min., or a little more, has a peculiar fascination, working so quietly and evenly, and also the paddles are well clear of any obstruction which the keel can clear. They are grease lubricated.

Her total weight seems to be half a ton, including 12 gallons of feed water and 36 lb. of coal in a full bunker. The exhaust steam is turned up the 3 in. funnel (inside the outer cover) and the blower likewise. Natural draught is not feasible for so small a craft. All the fittings and the entire outfit were constructed by myself with the exception of the pressure gauge, injector, a washout valve and a few petrol cocks which I utilised for such work as drain cocks for cylinders and lubricators.

I did not actually do the oxy brazing of the boiler seams, as it required a No. 6 jet and considerable preheating, and I had not the outfit. I performed nearly all other welding jobs by oxy-gas or forge. I had the moulding done by Hoskin's Foundry in Perth (W.A.) from my patterns, and got them to plane the cylinder's casting where necessary.

I trust this information and accompanying photographs will prove of interest to others who are seriously infected with the steam bug, as there is scope for much variation to suit individual conditions. Oil firing could be used, but would not be nearly as much fun to my way of thinking.

READERS' LETTERS

(*Continued from page* 610)

THE LOCOMOBILE

DEAR SIR,—Mr. G. Rosekilly's article on the Locomobile steam car (issue of September 23rd last) was of great interest to me as, during my apprenticeship in 1900, I was handed out a crashed four seater Locomobile to recondition and prepare for use. This machine was fired by a bunsen-type burner using petrol as fuel. I well remember the 197 half-inch tubes which all had to be replaced, expanded and beaded over in the boiler.

The burner was controlled by a thermostat, set to cut off at 180 p.p.i, and was quite satisfactory, and a pop safety valve came into the picture at 200.

A feed water heater was also incorporated in the outfit; in spite of this refinement, however, on putting the vehicle into service, results were very poor, and careful and constant nursing was necessary to maintain steam—and at this stage my traction engine experience was a great asset.

A little later a superheater was fitted, after which I drove many hundreds of miles; steam pressure and water level could be easily maintained, and when notched well up, a speed of 25 m.p.h. could be held, up hill and down dale.

Very soon, owing to increased power, the original block chain and sprockets were replaced by a heavier roller type, and apart from ball-bearing replacements on the rear axle, which at times had to be fitted *en route* and punctures which were dealt with by a large hypodermic syringe, motoring became, with this particular vehicle, a much enjoyed episode in life.

What eventually became of this car I do not know, but I do know that mixed in with various heavy steam haulage undertakings and the coming of the early I.C. cars, the Locomobile was a veritable Rolls Royce.

Yours faithfully,

Sudbury. G. W. DIXON.

WORKING MODEL JOWITT JUPITER CHASSIS

DEAR SIR,—When reading the account of the car models at the "M.E." Exhibition, I noticed an error in the description in the case of my scale model Jupiter chassis. It stated that it was a scale non-working model. This, of course, is incorrect; the motor is a working job, and comes out at about 16 c.c. As exhibited, the contact-breaker and distributor were non-working, as up to the present I have not overcome the physical problems of keeping the sparks in the right place in a distributor only ⅝ in. dia.! Had I put a working breaker and distributor it would have spoilt the scale appearance.

I may state that the radiator also is a working one, and all the water passages in the block were produced by milling and drilling.

Yours faithfully,

Sth. Petherton. C. D. SWEET.

WITH THE CLUBS

Society of Model and Experimental Engineers

On Saturday, November 20th, 1954, at 2.30 p.m. at the Caxton Hall, Westminster, Mr. K. N. Harris will give a lecture entitled "Automatic control of steam plant." Mr. Harris has given us many interesting talks in the past, and it may be confidently assumed that this talk will be no exception.

Visitors and members of other societies are cordially invited to attend this meeting.

York City & District S.M.E.

Further meetings of the society will be held on the following dates:—

November 20th—Illustrated talk, "Locos of the N.E. Railway" presented by the secretary.

December 4th—The society's annual general meeting, when all members should make every effort to be present.

The above meetings will be held in the Rechabite Building, Clifford Street, York, commencing at 7.0 p.m.

Hon. Secretary: W. SHEARMAN, 28, Terry Street, York.

The Gauge "1" Model Railway Association

At the annual general meeting, held in September, the Earl of Northesk was re-elected president, and also became chairman. Mr. J. T. van Riemsdijk was elected secretary, Mr. W. G. Kelly, treasurer, and Mr. S. J. Roberts, assistant secretary.

On Thursday, November 25th, by invitation of the Model Railway Club, the association will stage a track night in the Ambulance Room, Waterloo Station, S.E.1, at 7.30 p.m. It is expected that steam, electric and clockwork running will be possible, and all members who can are asked to attend and bring their models.

The association exists to encourage Gauge "1" modelling in all its aspects, and all enthusiasts interested in the gauge, or working in ⅝-in. or 10-mm. scales, are invited to contact the hon. secretary. There is a considerable interest in live steam in the association, and modellers who regard themselves as model engineers rather than model railwaymen will find fellow-enthusiasts in the association, and may have the opportunity of trying out their locomotives on "foreign lines" through the association's activities.

Hon. Secretary: J. T. VAN RIEMSDIJK, 40, Bancroft Avenue, London, N.2.

Southern Federation of Model Engineers

At the quarterly meeting held at Southampton recently, the delegates' report on the recent conference of affiliated groups which had been initiated by the Southern Federation was received and it was generally agreed that the co-operation between groups which the conference afforded would be most useful.

It was decided to seek the support of other groups for a resolution which was to be forwarded to the organisers of the "M.E." Exhibition making suggestions for the improvement of the exhibition and in particular the better protection of exhibits, and the provision of a railway track and models in steam.

The Andover Society stated that they had taken up with the Railway Executive the question of a special rate for the transport of models to exhibitions by rail, as a result of which it was hoped that a new rate be added to the railway schedule.

Hon Secretary: R. A. READ, 90, Woodside Road, Salisbury.

Exeter and District M.E.S.

Work on the "O"-gauge layout is still being continued on Wednesday and Saturday evenings at our headquarters in St. David's Hill, Exeter, and the completion of the entire outfit is now in sight. When the committee decided to postpone the exhibition, they adopted additional refinements in order to produce as complete an exhibition railway system as possible.

It is hoped that testing will commence in the New Year and this will cover several weeks, during which the operators will have plenty of practice at the controls.

The society's 5-in. gauge track has proved a very popular source of enjoyment and interest during the summer, and we are grateful to the Princess Elizabeth Orthopaedic Hospital authorities for their kindness in lending us the ground on which our track is laid.

Hon. Secretary: L. M. R. HISCOCKS, 5, Prince Charles Road, Exeter.

The above photograph was taken recently at the Mandeville School Fete, St. Albans, where the St. Albans M.E.S. held an exhibition in one of the class-rooms. It shows a small corner of the room with a few of the many exhibits including Mr. Clifford's "Blue Streak," Mr. V. Vousden's tug "Meg," and Mr. L. Curtis's "Seal" and his new 30 c.c. power unit. Mr. R. Mapplebeck can be seen instructing some interested spectators of the younger generation, which is the aspect we like to stress

The Junior Institution of Engineers

Friday, November 19th, at 7.0 p.m. Pepys House, 14, Rochester Row, S.W.1. Chairman's address: "Engineering Plant in Buildings," by S. G. Clark (member).

North-Western Section—Monday, November 22nd, at 7.30 p.m., in the Fairbairn Room at the Engineers' Club, Albert Square, Manchester. Ordinary meeting—Paper: "Braking Practice," by C. R. Gundersen (Ferrodo Ltd.).

Friday, November 26th, at 7.0 p.m.: Annual General Meeting.

Friday, December 3rd, at 7.0 p.m. Pepys House, 14, Rochester Row, S.W.1.: Film evening. "The Manufacture of Portland Cement."

North-Western Section: Monday, December 6th, at 7.30 p.m., in the Fairbairn Room at the Engineers' Club, Albert Square, Manchester. Ordinary meeting—Paper: "Design and Construction of Horizontal Boring Machines," by W. Tomkinson (H. W. Kearns & Co. Ltd.).

Friday, December 10th, at 7.30 p.m. Pepys House, 14, Rochester Row, S.W.1. Inaugural meeting—Presidential address: "Engineering in the Twentieth Century," by Prof. S. J. Davies, D.Sc., Ph.D.

Sheffield and District Section—Monday, December 13th, at 7.30 p.m., at Livesey Clegg House (opposite Union Street Cinema), Sheffield. Ordinary meeting—Paper: "Post-war Developments in Coal Face Machinery," by S. McCallum, A.M.I.Mech.E. (Mayor and Coulson Ltd.).

Aberdeen Model Engineering Society

Our annual exhibition will be held in the Music Hall, Aberdeen, from December 22nd to 25th. Open from 11.0 a.m. to 10.0 p.m. daily.

Hon Secretary: A. W. GAULD, 261, Victoria Road, Aberdeen.

Tyneside S.M.E.E.

The next meeting of the society will be on Saturday, November 20th, at 2.45 p.m., in the rooms of the Newcastle Photographic Society, Rutherford Street, Newcastle-upon-Tyne. Unless something else turns up, the afternoon will be devoted to a talk by Mr. Lamb on "Stage Lighting and Equipment."

Sectional meetings have been arranged for the following:—

Experimental—November 29th, Chatter.

Model Car—November 22nd, Subject not yet decided.

New members should note that the section meetings are held in the workshop at Manors Station.

Hon. Secretary: L. JAMIESON, 7, McEwan Gardens, Newcastle-upon-Tyne, 4.

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WORKSHOP EQUIPMENT

Buck & Ryan for Lathes and Accessories, drilling machines, grinders, electric tools, surface plates, etc.—310-312, Euston Road, London, N.W.1. Phone Euston 4661.

Rebuilt Lathes. The Acorn Machine Tool Co. (1936) Ltd., over rebuild to limits "Acorntools" and "Atlas" 16" swing s.s. available. Write—610-614, Chiswick High Road, W.4. (Phone: CHI 3416).

"Impetus" machines, wood planers, motorised, drills, belt sanders, electric motors, paint sprays, air compressors, circular saws, etc. Catalogue.—JOHN STEEL, Castlefields, Bingley.

Milling Spindle for 3"/4" lathes

Castings 15s., Finished (no chuck) £5.2.6
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The Acorn Machine Tool Co. (1936) Ltd. are in a position to undertake the complete rebuilding of Atlas, Acorntools, Sphere and Halifax lathes, or if preferred, we can supply any spare parts that may be required for these machines. Full range of accessories and equipment for all these machines also available. Generous, allowance given on old machines against the supply of new "Acorn" lathes. Second-hand machines of Atlas and Acorntools manufacture, rebuilt by us available from £75 each.—Write to—610-614, Chiswick High Road, W.4. Tel.: Chiswick 3416-7-8-9.

The 2½" × 10" E.W. Lathe. Unrivalled in its class. Plain lathe £13 4s. Fully convertible to backgear, and screwcutting. Can be obtained on the easiest of terms from 5s. weekly. Send s.a.e. for details. Adept lathes, shapers, Perfecto shapers, Britinol blow lamps. No interest, no fuss credit terms. Details s.a.e.—WANSTEAD SUPPLY Co., 48, High Street, London, E.11.

That Lathe You No Longer Require. Corbett's (Lathes), Stanton Hill, Sutton-in-Ashfield will purchase it. Send us details. Send 1s. for bargain priced lists of second-hand lathes on offer. Hire purchase to suit your pocket.

Mechanical and Model Supplies. The South Eastern Stockists for Myford, E.W. and Adept lathes and accessories. Burnerd chucks. Wolf and Bridges electric drills. Eclipse and M. & W. tools. Picador pulleys, etc.—39, Kings Road, St. Leonards-on-Sea, Sussex. Tel.: Hastings 4993.

Wanted. Cabinet Stand for "M.L.7." Maker's preferred, reasonable price.—C. B. COVENTRY, 42, Westborough Road, Maidenhead.

3" × 18" B.G.S.C. Lathe 1/3 h.p. motor c/shaft 4½" × 4-jaw chuck, 20 ch/wheels, excellent for beginner, £25.—Box No. 7504, MODEL ENGINEER Offices.

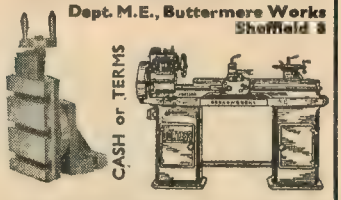
3" B.G.S.C. Lathe, £10. Cam jigsaw, £2 10s. ½ h.p. motor, £4. Union drilling machine, £3. ½" bench drill, £1 10s. Together, £20.—GOUDIE. CHI 6974 & 5.

Myford M.L.7 3½" lathe, 1/3 h.p., 230 volt, a.c. motor, 4" s.c. chuck, drill chucks, good selection tools, bench vice, many extras, £65.—F. WHITTER, 184, Heath Lane, Dartford, Kent.

Contents of Model Engineer's Workshop, including Damaco treadle lathe, with all fittings. Work bench, high class tools, List supplied. Buyer to collect, £45. Might separate.—23, Castle Street, Framlingham, Suffolk.

Rear Toolposts, M.L.7, £1. Leaver tailstock attachment M.L.7, £1 10s. 0d.—4, Honey Hill, Kingswood, Bristol, Glos.

CHARLES PORTASS & SON
Dept. M.E., Buttermere Works
Sheffield 3



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New H.S. M.T.S. Reamers, makers' wrappers: 7/16", 13/32", 3/8", 23/64", 11/32", 5/16", 1/4", 15/64", 7/32", 5/32", 9/64", 1/8". Cost £6. 37s 6d. lot, postage 2s.—ATTFIELD, 221, Green Lane, London, S.E.9.

Lathe Stand and chip tray, £2 10s. Micrometers 0-1", 25-50 mm., £1 each.—30, Grove Gardens, Teddington, Kingston 9367.

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Exchange. 3½" back-gear screw-cutting lathe with chucks, gears, stand and countershaft, etc., for 8" adjustable circular saw, planer, wood-working tools to value, £20 on cash sale.—H. BELLHAM, Hanslope, Wolverton, Bucks.

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The Wenvoe Model Engineering Co. Port Road, Wenvoe, Cardiff. For all castings and materials. To build most of the Popular locomotives from 2½" to 5" gauge designed by "L.B.S.C." Also 1" scale "M.E." Traction Engine. ⅛" square graphited steam packing. Stainless balls and rods, etc. Satisfaction assured. Stamp for reply. Open to callers, Saturday and Sunday.

Wanted. Old S.V. 2 Cylinder Engine worth rebuilding, overcrank or mill type, about 3-in. stroke. Wanted outside loco cylinders on motion 7" to 10" gauge.—Box No. 7514, MODEL ENGINEER Offices.

3½" Gauge P.V. Baker, good working order. Any reasonable offer accepted.—Tel.: WX. 3193.

New Stuart "Sun" Engine, c.w. lubricator, £3.—14, Buckingham Road, Lytham St. Annes.

For Sale. 5" Ajax almost complete. 3½" 2-6-4T complete. 2½" and 1 gauge equipment. S.A.E. particulars.—Box No. 7524, MODEL ENGINEER Offices.

Luken's-O'-B'ham live steam specialists Sir Morris de Cowley 4-6-2 gauge "O" tender loco blueprints 10s. 6d. set, frames 1s., wheels, 10s. 6d. set, cylinder castings, 6d. Send 6d. for list.—10, Coldbath Road, Birmingham 14.

Stuart V 10's For Sale. Machined and assembled and ready to run. New. £5 10s. each.—Box No. 7525, MODEL ENGINEER Offices.

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Sale. Marine Twin D.A.S.U. "Warrior" engine, ¾" × ¾". Bargain, £10. Miscellaneous pumps, fittings, etc. S.A.E. for details.—P. 58, Onslow Gardens, Wallington, Surrey.

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House Service Meters. 200/250 V, (a.c. or d.c.). Credit or prepayment type.—UNIVERSAL ELECTRIC Co., 220, City Road, London, E.C.1.

A.C. Motors, Delco Capacitor, start induction 200/250 V, 50 cycles, 1-phase, 1,425 r.p.m., ¼ h.p., £3 12s. 6d.; 1/3 h.p., £4 17s. 6d., ½ h.p., £6 10s. Perfect and guaranteed. Passenger carriage, 5s.—JOHNSON ENGINEERING COMPANY, 319, Kennington Road, S.E.1. Reliance 1412/3.

Electric Motors, generators, starters, ⅛ to 40 h.p., a.c. or d.c., 100-350 V, switches, cables, electric tools. Exchanges.—VERNON SMITH LTD., 354/366, King Street, London W.6. RIV 3964.

If not satisfied return within 14 days Cash refunded in full.

Five drawer Steel Tool Cabinet. Drawer sizes are 7" × 3½" × 1 5/16". **11s. 6d.**

Five drawer Wood Tool Cabinet. Drawer sizes are 6" × 4" × 1 5/16" steel. **12s. 6d.**

Or for 6s. extra Bolts, Nuts, Springs, etc., etc., about £1 worth will be sent with any tool cabinet.

Six drawer Steel Tool Cabinet, 33" high. Drawer sizes are 9" front, 3¾" high, 18" front to back, **£2 7s. 6d.**

Bright and Cadmium plated nuts and bolts, 14 lb. **16s.**; 28 lb. **30s.**

All carr. paid G.B. and N. Ireland, packing free. C.W.O.

18,000 hardened, and ground tool steel drill bushes, **1s.** each, **10s.** for 12, or **£3 10s.** per 100. C.W.O. or C.O.D.

E. HUNTINGTON
38a, Cemetery Road, Southport, Lancs.

Motors. **Brand New** ¼ h.p., B.T.H., 220/250 V, a.c., £5 each. Also large stock all types a.c. or d.c. S.A.E. for list.—J. S. RAMSBOTTOM & CO. LTD., Keighley, Yorkshire.

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The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 *inclusive or a woman aged* 18-59 *inclusive unless he or she or the employment, is excepted from the provisions of the Notification of Vacancies Order,* 1952.

McMichael Radio Ltd., Slough, Bucks, have vacancies of interest to keen model makers preferably with some practical radio knowledge. Professional experience is not an essential qualification. Write to, or call upon the—PERSONNEL MANAGER, Dept. ED/MM.

GENERAL

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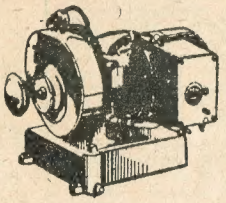

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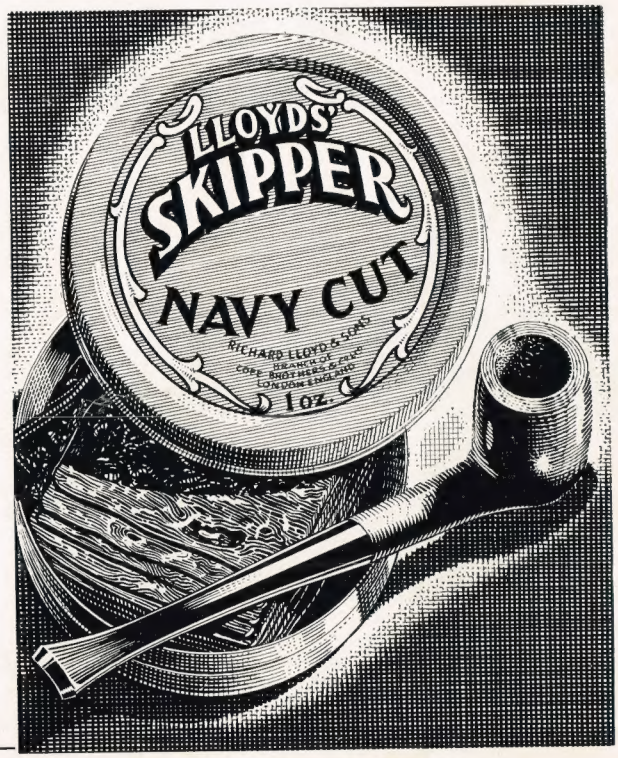

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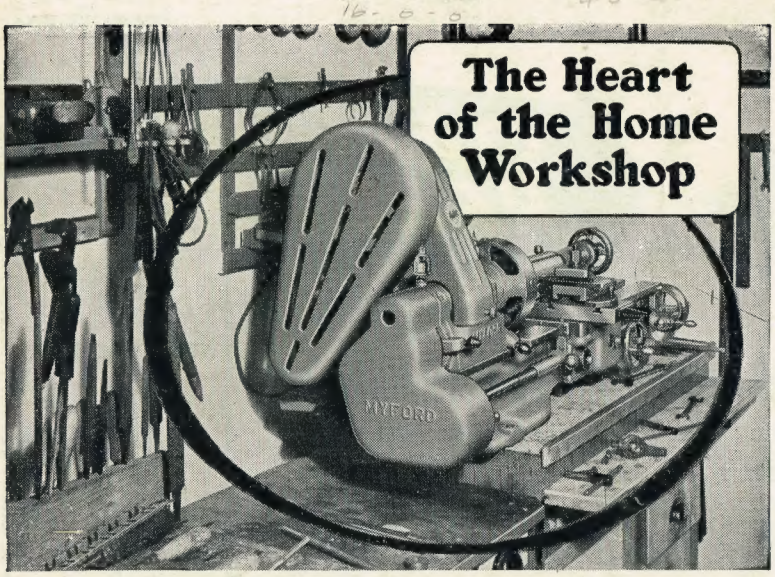

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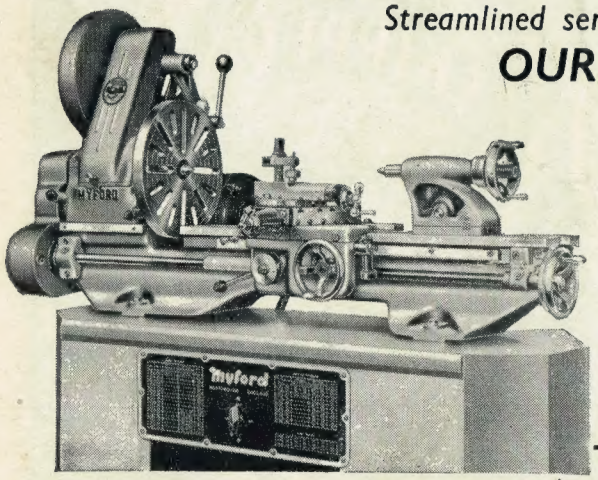

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